The Foundry

For September

Tax Avoidance And Business Survival

CERTAIN merit attends any tax avoidance which affords escape from giving hard earned money to politicians who squander and bribe.

THE FOUNDRY mistrusts governmental attacks which would put industry under control of politicians of any party. It resents political pressure which levies taxes on productive industry to be wasted on boondogglers or to bribe hog murderers or crop destroyers. This is not politics—it's sense.

Why give wasters more money? Don't you pay taxes on everything you own, earn, buy, eat, wear or look at?

Now comes the tax on reserves, a communistic blow at every owner of a business, every salaried employe and every wage earner. The slippery, sugared "social security" tax will support thousands of government spenders and snoopers. The tax on reserves will destroy *security* for all workmen in the next business slump.

Few foundries have come through the depression with reserves that escape this new tax blight. How can most foundries provide for the future? How can they protect their business from the sheriff? How pay wages, salaries, when orders slacken and the balances are red?

Payment of dividends to avoid surplus is a way out. This is pleasant to stockholders, long deprived. Stock dividends within certain restrictions also apply.

But these measures fail in beating the taxeaters. They do not build for the future of any company. Should existing values be conserved? How can the business man insure the future of his employes and stockholders?

Spending for plant and equipment is sound. It is one way to conserve values for capital, management and labor. Larger wages and salaries keep money from the clutches of politicians. They reward real work and service. Why wait until shortage of men puts pay on the basis of competition instead of reward. Will higher wages demand higher prices for castings? What of it? Increased prices are long overdue.

Perhaps profit sharing might provide the best means of avoiding the reserves tax. Keystone Steel & Wire Co., Peoria, Ill., recently announced such a plan as follows: 4 per cent on all profits up to $1,000,000; 8, 12, 16 and 20 per cent on the next succeeding increments of $100,000 profit and all over $1,300,000 to bring 20 per cent distribution to employes. Why not try such a plan to circumvent the taxgrabbers?

Insurance Rates

WHEN railroads granted rebates, watered stock and greased political palms the interstate commerce commission was born. Bad management brought regulation to the railroads. Government control always restricts, never promotes development. Taxes, trucks and buses then brought railways to the brink of ruin while heavy industry, stockholders and the public suffered. The new management may be better today, but the curse of old sins persists in stringent and hampering regulation. The threat of government operation or ownership overhangs.

Bad management brought regulation to old line insurance firms. It fostered mutual companies, some good and others shams, as many have found to their cost. Rate setting in employe health and accident compensation is far from scientific. Often the insurance attitude is to set the rates at a prohibitive level, to ignore experience and to refuse coverage. This invites self-insuring, state and eventually federal compensation based on taxes. Bad management again leads along the road to government operation—socialization, stultified ruin.

Who that is honest, wants that?

Editor

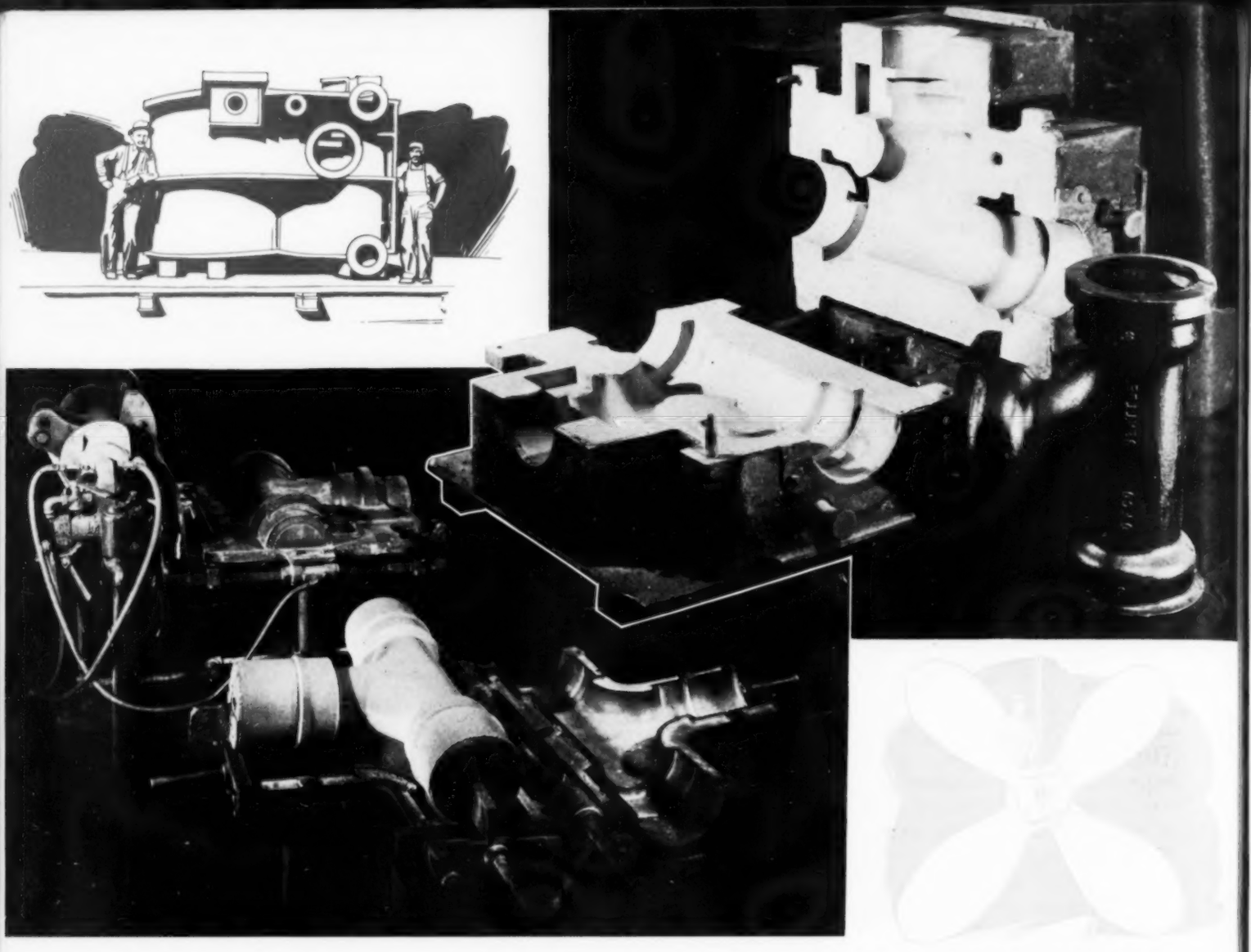


Fig. 1, (Upper left)—15-ton low pressure cylinder for marine engine. Fig. 2, (Lower Left)—Green sand core for pipe fitting made in hinged corebox. Fig. 3, (Upper right)—Special cast iron flasks are employed conforming closely to the shape of the casting. Fig. 4, (Lower right)—Typical cast iron propeller, weight 11 tons

Operate Shop on Pacific Coast

By PAT DWYER

IN THE early days of the American oil industry, when great numbers of sanguine and more or less gullible and inexperienced people saw visions and dreamed dreams of vast wealth as a result of hitting one of the concealed sources of liquid, flowing gold, a member of the peripatetic tribe, a wandering Ishmael sought the advice of an ancient prospector, well digger and promoter, a man who through years of experience might be described as literally dripping or soaked in the lore of the oil fields.

The seeker for information asked the veteran if there was not some infallible rule, some reliable data by which a man might know in advance whether he was going to win or lose on the venture. Sinking a well is an expensive process, win, lose or draw; a total loss if sunk in a barren or unproductive area.

The walking encyclopedia did not disappoint him.

"Oil," he explained ponderously and pontifically, "Oil is found where you find it!"

The same unpredictable element confronts any person present at the birth of a new town. He may acquire a few acres for $4 in cash and a bottle of rum and in the course of 50 or 100 years he or his heirs may collect more in rentals from buildings erected on the property, than the owners of the Comstock lode drew out of that magical hole in the ground. On the other hand the hypothetical investor may be left holding the bag when the prospective population fails to materialize as per expectations.

Oil is found where you find it.

Cities are found where you find them.

For example? Well, for example consider the

city of Seattle, hustling, progressive young giant of the Pacific northwest, a heartening sight by day, and probably at night the most brilliantly illuminated city in this or any other country.

Eighty years ago the place was an Indian camp, where a handful of dusky inhabitants depended on the sun by day and the moon and stars by night for the illumination of their flimsy little wigwams. The first white man of record appeared in the territory in 1852 and was followed slowly by others, fishermen, whalers, hunters and trappers until by 1870 the white population had increased to the impressive total of 1107. This number was more than tripled—to be exact the population was 3533—in 1880. The flourishing young city was practically wiped out by fire in 1889, but apparently this did not dampen the enthusiasm of the inhabitants, numbering 41,847 according to the United States census for 1890.

At the beginning of the new century, 2 years after the first stampede to the Klondike had rushed through that seaport city, incoming and outgoing trade had raised the population of Seattle to 80,671. Three years later, in 1903 it had jumped to 121,813.

When the latest federal census was taken in 1930 the population was given as 365,583. At present the estimated population is creeping up around the half million mark. Truly a remarkable record of growth and expansion, from a small ring of Indian tepees to metropolitan splendor in the comparatively short period of 80 years. Perhaps it's the climate.

Following the advice of the late Mr. Shakespeare touching on tides in the affairs of men, and the advantage of catching a tide at the beginning of the flood, Charles W. Kucher in 1900 decided to establish a gray iron foundry in the rapidly growing city of Seattle. The first modest little plant, operated then as now by the Olympic Foundry Co., had a daily capacity of 1½ tons of gray iron castings. This capacity was increased from year to year until finally when extension no longer was possible on the original site, an extensive property was secured on Airport way in the industrial section of the city. A large modern plant was erected with a potential capacity daily of 60 tons. The plant is equipped to handle single castings up to 30 tons in weight.

From the beginning, marine castings of all descriptions have figured prominently in the daily schedule, ranging in size and weight from small parts to large propellers and engines. During the period of shipbuilding activity on the Pacific coast, the daily output of that class of castings was 35 tons. The 3000-horsepower triple expansion marine engine shown in Fig. 8 is one of 40 similar units cast in a period of 18 months. Castings in each engine weighed 125 tons. A low pressure cylinder, weight 15 tons, for one of these engines is shown in Fig. 1.

The group of buildings comprising the plant is situated strategically at the base of a hill close to the main line of the Northern Pacific railroad. A spur track at the high side is on a level with the charging floors of the cupolas and with an extensive storage yard. Through suitable trap doors in this elevated floor, sand and other materials required in the foundry are discharged to bins located below, or on a level with

Fig. 5—The shop is provided with adequate facilities for handling large castings into which the metal has to be poured from two or more ladles simultaneously

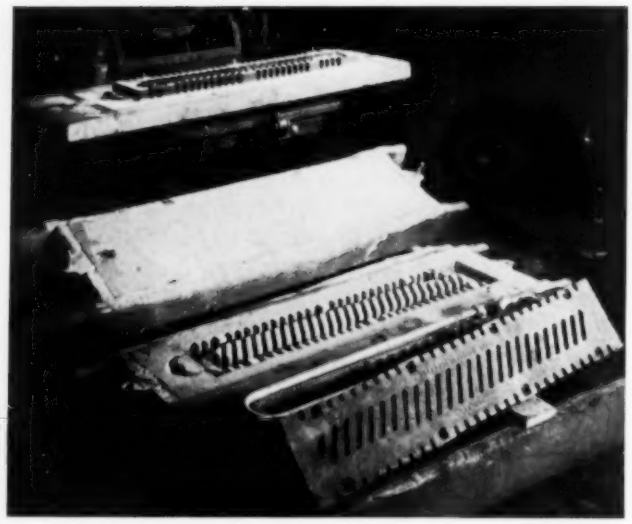


Fig. 6—Pattern, mold and casting for water cooled grate bar. A pipe coil is placed in the mold

the main foundry floor. Beginning with a new executive office building finished in stucco and tile, the buildings taken in regular order include the machine shop, pattern department and foundry. The machine shop is equipped with modern tools in wide variety to handle either jobbing work, or several lines of specialties which the company has developed.

Owing to the mild climate no end walls or doors are required in the foundry building 400 feet in length, with a crane extension of an additional 110 feet over a flask yard at one end. A monitor roof with swinging sash in the sides provides ventilation. Light from these windows also supplements the light from the continuous windows in the side walls of the building. A double row of columns supporting the roof, also serve to divide the shop longitudinally into the conventional three bays characteristic of the great majority of American foundries. The central bay spanned by two 20-ton cranes is devoted principally to the production of heavy castings. Small castings are made in one of the side bays, while the other side bay houses the melting equipment and the storage bins for various classes of materials.

Gray iron, either plain or alloyed for special service, is melted in three cupolas lined respectively to 40, 36 and 26 inches. Malleable iron is melted and annealed in electric furnaces. Details of this interesting recent development in which the castings are annealed in 28 to 30 hours will be presented in the second installment of this article in an early issue of THE FOUNDRY. The department is typical of the methods pursued by the company in a constantly aggressive campaign to open up new markets and find increased outlet for foundry products. In recent years Mr. Kucher Sr. has been assisted by his sons Ronald and John.

Several years ago John Kucher was faced with the problem of filling temporarily empty space in the foundry incident to the falling off in demand for certain classes of castings formerly manufactured in considerable volume. He organized an independent department to handle small castings exclusively. He installed a number of power squeezer machines and gradually broke in a crew of operators, willing, intelligent young men, but with- (*Please turn to page* 70)

Fig. 7—General view of the main bay and one side bay of the foundry. The bay on the left containing the cupolas is built into the side of a hill

Eliminate Defects By Avoiding Common Pitfalls

By N. K. B. PATCH

LITTLE things that influence the quality of castings so often are overlooked that directing attention to them at any time is appropriate. The busy foundry foreman tries to watch each and every detail, but manifestly this is impossible in the rush of the daily drive for production. A typical example may be found in the small brass foundry where most of the molds are made by hand rather than by the machine molding process. Before drawing the pattern the molder runs a swab around the edges. Obviously the addition of water to sand which has been carefully tempered, may cause trouble. On the other hand if swab water actually is necessary, it may be accepted as evidence that the sand is not in proper condition. It is far better practice to see that the sand is maintained with the proper temperature than to use swab water as liberally as it is employed in many instances.

Can Determine Proper Amount

Of course occasions arise where the application of swab water may be necessary, but this point should be determined by competent authority and not left to the whim of any inexperienced operator. Extended scientific investigation in the foundry field has standardized the correct amount of moisture for properly bonding molding sand. Naturally the actual amount varies under different conditions and no arbitrary figure can be set down to apply to all sands. A careful study will reveal the correct moisture content for sand employed in molding any given class of castings in any given plant.

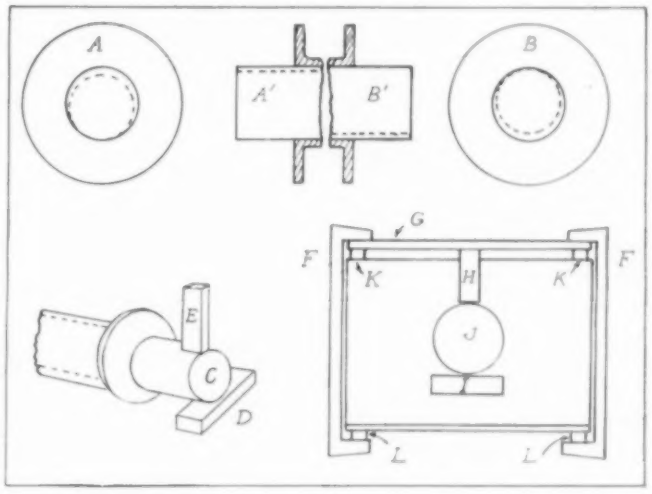
After this has been determined, care should be taken to see that the sand piles are maintained as nearly uniform as possible. Additional water should not be added except in an emergency. Attention to this detail will eliminate many of the blowholes usually attributed to hard ramming, defective cores or other causes. In many instances excess water, the real cause of the blowholes is ignored, overlooked or remains unsuspected.

Misplaced or eccentric cores is a foundry item that cannot be passed over as unimportant. Core prints in corebox and on the pattern should be measured carefully to see that they coincide. The core print in the mold should be of correct size to receive the core without crushing, but should not be over size to the extent that the core will lie off center, or move under the influence of the metal. In constructing a pattern, adequate prints should be provided to support the weight of the core. In many instances the prints are cut short to economize flask space. The prints will not hold the core properly. Pressure of the metal moves the core, breaks sand from the edges of the core print, produces a dirty casting with a core out of place.

Results in Extra Thick Metal

This feature is illustrated at *A* and *B* in the accompanying illustration. At *A* where the core rests in an over size print the mold space above the core is greater than the mold space below as indicated by the dotted lines in *A* and A_1. Later under pressure of the metal the core is lifted in the print as at *B* and B_1 with a resulting extra thickness of the metal in the lower part of the casting.

In certain instances where the prints are too small to support a heavy core properly, the molder may reinforce the print by ramming a brick, a piece of plate or other solid object with a large bearing sur- (*Please turn to page* 73)



Above—Core moves in loose print. Left, Below—Core held between bricks or blocks. Right—Wedges K support bar on standard H. The entire assembly is clamped by driving wedges L on the bottom

BUILT EARLY ELECTRIC FURNACE

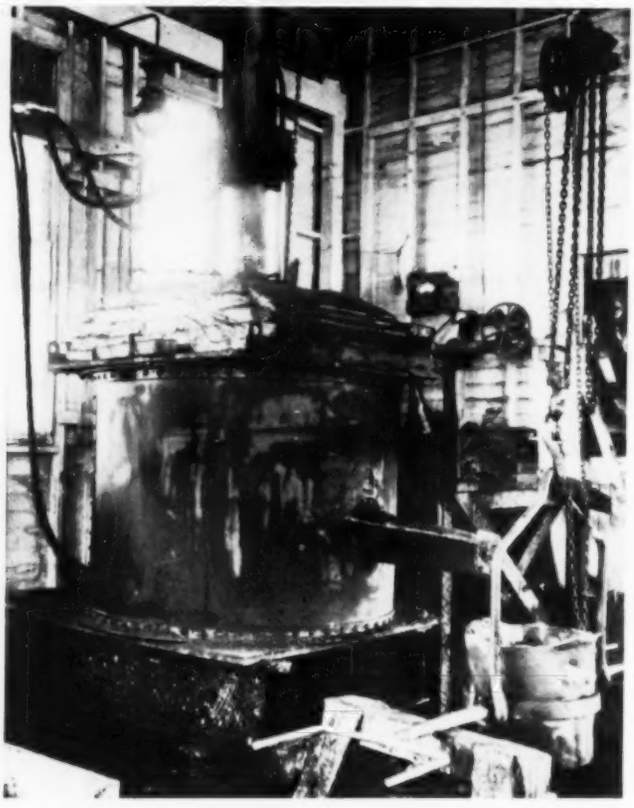


Fig. 1—View of the furnace showing its plain cylindrical steel shell, and method of support

ROBERT GREGG, foundry superintendent, Reliance Regulator Corp., Alhambra, Calif., presents interesting data and illustrations of what he states was the first electric furnace constructed and operated for the production of gray iron castings on the West coast. When this furnace was built in 1917, Mr. Gregg was connected with the Hesse-Martin Iron Works, Portland, Ore. The company built the furnace to produce synthetic cast iron from charges of steel scrap, chips and borings from the machine shop. Necessary adjustment in the carbon, silicon and manganese content was effected by the addition of suitable amounts of petroleum coke, ferrosilicon and ferromanganese.

Had Good Physical Properties

Physical properties of the metal poured into castings for power transmission machinery were quite satisfactory as shown by the analysis of typical test bars set forth in the accompanying Tables I, II and III. The metal charge from which the test bars in Table I were poured was made up entirely of steel punchings. A sufficient amount of ferrosilicon was added to raise the existing silicon content by 1.70 per cent. Tensile or transverse tests were not taken on this set of bars. Accuracy of control in the manipulation of the heat is reflected in the similarity of results on all the test bars.

The mixture on which the results are shown in Table II was made up of 50 per cent steel punchings and 50 per cent mixed steel and iron turnings with the addition of 1.75 per cent silicon. The test bars 1¼-inch diameter, broken on 12-inch centers showed an average transverse strength of 3600 pounds and a deflection of 0.17 per cent.

Test bars for Table No. III were poured from a mixture made up of a miscellaneous quantity of steel and iron turnings and borings with 1.75 per cent silicon added to the charge. Transverse and deflection were similar to those shown in Table II.

Employed a Bottom Electrode

The furnace was a plain cylindrical steel shell 48 inches diameter and 48 inches high resting on a square steel plate supported 36 inches above the floor on an I-beam foundation. The shell was insulated with a single course of a sil-o-cel brick and a row of regular furnace silica brick.

In this single phase furnace a bottom electrode was formed by using a cast iron plate 24 inches diameter, 1 inch thick with a wing or projection extending outside the furnace shell for a ground. The upper face of the plate was equipped with prongs or dabbers (*Please turn to page* 74)

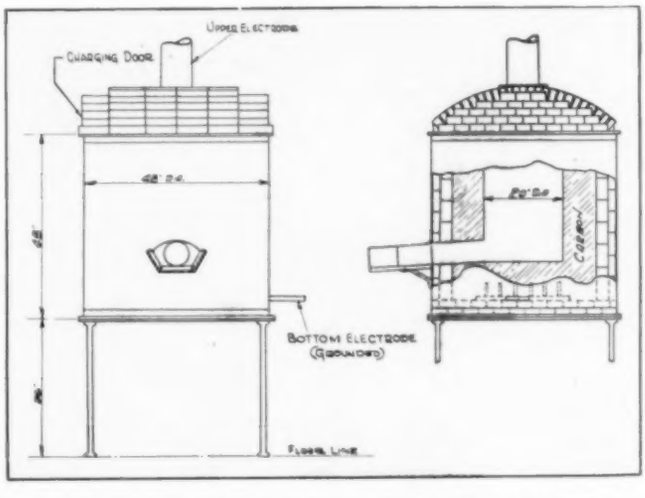


Fig. 2—Sketches of the furnace giving the principal dimensions and a cross sectional view

Cost Rise Outstrips Prices

Statistical study shows gray iron foundries pay for used materials on rising markets

By W. W. ROSE
Executive Vice President
Gray Iron Founders' Society

THERE are few, if any, reliable statistics on the gray iron foundry industry. No inclusive capacity, production or operating figures are obtainable over the entire industry.

Recognizing this want, the Gray Iron Founders' society, Cleveland, with the co-operation of members of the industry, has completed an exhaustive study of 200 identical foundries over a period of three years. The foundries comprising the group are located in every part of the United States and represent every type of gray iron casting producer, both large and small. Foundries submitting figures so far out of line as to be manifestly incorrect were omitted so that it is believed that the sample quite accurately represents the trend of the business.

Turning first to the production of these two hundred guinea pigs we find that in 1933 they produced 129,694 tons of castings for which they received $11,718,646, or an average of slightly under 4.518 cents a pound.

The following year, 1934, these same foundries produced 167,425 tons and received $15,936,831, or slightly over 4.759 cents a pound.

In 1935 the tonnage of this same group mounted to 233,726 tons for which was received $22,808,883. This represents slightly under 4.879 cents a pound.

Unfortunately, no figures are available running back over long years, from which an average or normal can be determined for comparison. Even the 1928 averages favored in many compilations, or the average of three years commonly used as a basis in the comparison of machine tool and other commodities do not exist in the gray iron field.

Obviously, gray iron output in 1933 was at low ebb. It has been variously estimated that it did not attain more than 25 per cent of normal. However, for the purposes of this comparison it will be necessary to adopt 1933 as 100 per cent.

Examining these figures in the light of percentages and taking the 1933 basis as 100, we have in tonnage a rise to 121.38 in 1934 and to 180.21 per cent in 1935. The total amount of money received from this increase in tonnage was 135.14 per cent in 1934 and 194.64 per cent in 1935, with the 1933 base at 100 per cent.

It will be noted that the price per ton on a percentage basis re- (*Please turn to page* 76)

Percentage Increase in Local Prices, 1933-1935

(Commodities Used in Gray Iron Foundries)

Increase in Price 1935 over 1933*

Locality	Pig Iron	No. 1 Scrap	Steel Rails	Coke	Plumbago	Core Oil	Core Sand	Molding Sand	Lime Stone	Fire Brick	Fire Clay
Seattle	5.5	29.41	.....	8.69	.....	.....	.....	.....	.....	3.33	.....
Oakland, Calif.	15.38	25.0	13.63	8.69	11.11	12.32	.....	.....	.....	18.64	.....
Chicago	18.35	12.20	20.83	22.58	.....	13.33	26.0	.....	12.67	36.36	8.34
	21.87	.....	.....	13.88	.....	14.89	.....	.....	.....	.....	.....
Milwaukee	21.0	10.50	.....	17.14	58.82	35.00	8.57	1.60	14.70	3.81	0.80
	.....	.....	.....	20.00	.....	.....	.....	.....	.....	.....	.....
Cincinnati	35.13	35.00	11.54	16.85	.....	5.0	11.65	3.27	6.78	.....	.....
	43.15	60.00	47.37	18.01	.....	.....	.....	.....	.....	.....	.....
Cleveland	21.21	14.28	17.31	18.14	.....	17.78	3.70	4.08	15.15	11.11	10.77
Buffalo	15.94	4.0	42.11	15.85	.....	60.0	4.21	1.88	20.97	20.0	40.0
Philadelphia	31.06	27.78	.....	0.53	6.67	7.27	12.0	6.00	.....	.....	.....
Connecticut	5.71	5.26	.....	5.32	12.07	.....	21.62	29.63	36.36	.....	.....
Massachusetts	40.19	10.34	81.65	4.76	.....	.....	.....	6.95	.....	.....	11.65
	3.71	16.16	18.18	11.42	4.0	9.09	.....	.....	22.22	7.50	7.69
St. Louis	18.75	26.47	27.77	21.21	8.33	36.58	69.28	16.08	75.75	10.0	22.22
	31.40	35.39	57.50	27.27	.....	52.72	.....	.....	.....	21.16	43.75

*NOTE—Multiple percentage figures obtained from several reports indicating purchases of various grades from different sources, or at varied weeks with wide market changes.

FOUNDING OF PRESSURE CASTINGS

By H. H. JUDSON
Goulds Pumps Inc., Seneca Falls, N. Y.

This is the second of two articles from the annual exchange paper of the A. F. A. presented at the recent Glasgow conference of the Institute of British Foundrymen.

PROFESSOR G. B. Upton, in his book, *Materials of Construction* notes that: "If the metal is poured *cold,* the outer part of the casting cools sharply, in heating up the mold, and the center cools very slowly during freezing. If the metal is poured *hot,* the mold will be thoroughly heated long before freezing, and the piece will be cooling rapidly throughout during freezing."

Reference to cooling rate curves of steels quenched in various liquids shows that the thought behind the previous statement is that an appreciable length of time has passed, after pouring, before establishment of the temperature gradient that governs the cooling rate of the casting, especially the rate through freezing. Dull pouring, that is pouring near the freezing temperature, brings about a quick freezing of the skin of the casting, by heating up the cold mold, but does not provide the necessary temperature difference between metal and mold to establish a steep temperature gradient when freezing is approached. Thus the interior of the casting cools relatively slowly. On the other hand, pouring hot heats up the mold and only a slight skin is formed, leaving the interior still molten and at a sufficiently high temperature so that when the freezing temperature is approached a steep temperature gradient already has been established and relatively rapid freezing occurs.

Figs. 6 and 7 represent, schematically only, the time-temperature relationships in the cooling of two similar castings, one poured dull and one poured hot, from the same ladle of iron. These curves are typical of cooling curves of quenched steels. The skin temperature drops rapidly through the freezing range and beyond. The center does not decrease in temperature at the start. However, this decrease in skin temperature soon sets up a temperature gradient between the skin and the center. The skin then begins to draw heat from the center, and the drop in temperature of the skin to the mold is retarded. The center now is cooling and in-

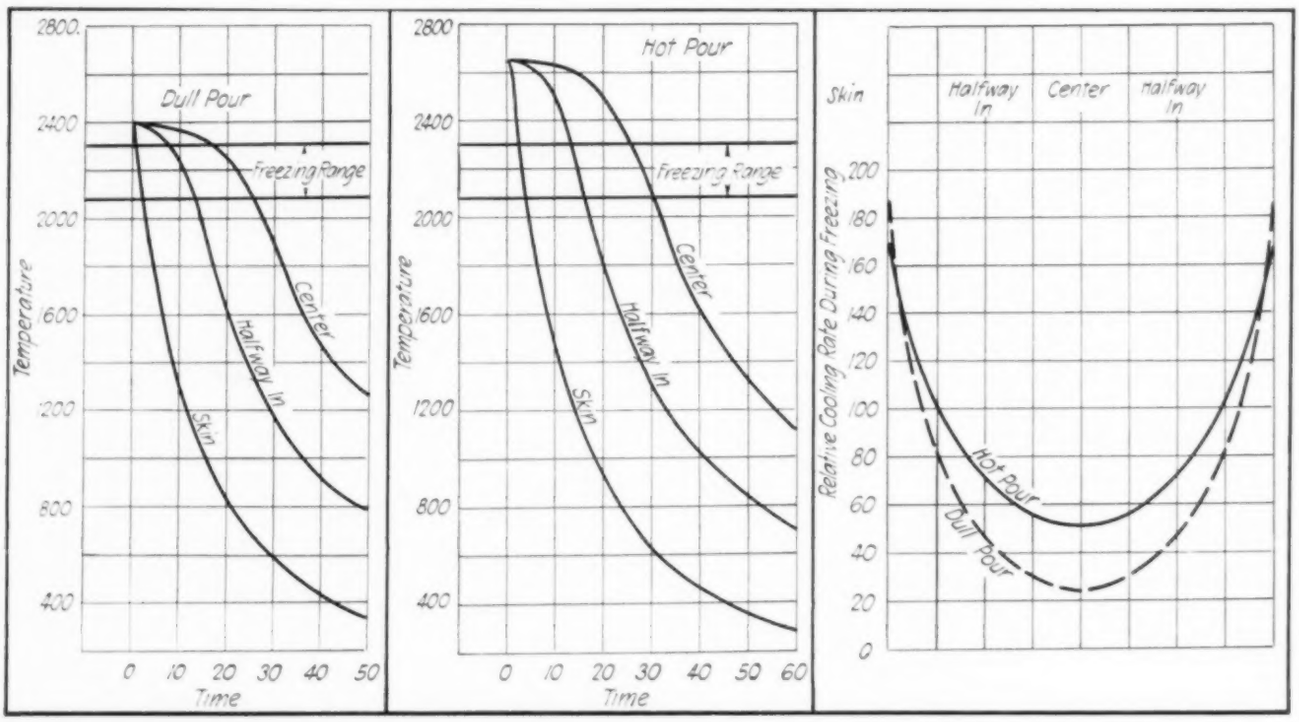


Fig. 6—Time-temperature relationship of the cooling of a casting poured with dull iron. Fig. 7—Relation of time and temperature in cooling of a casting poured with hot iron. Fig. 8—Cooling rates of castings poured with dull and hot irons through same freezing range

creasingly greater cooling rates are being established as the time interval after pouring increases.

Consider the dull poured casting, Fig. 6. The casting is poured just above the freezing range. So before sufficient time has elapsed to permit the development of a rapid cooling rate, the casting has begun to freeze. The skin has already passed through the freezing range at a rapid rate, and therefore shows a fine grained structure. The curve representing the casting halfway between the center and the skin indicates that the casting is cooling less slowly through the freezing range and will show a coarser structure than the skin. The center is cooling still more slowly through the freezing range and will have a still coarser structure. There has not been sufficient time for the casting to set up a steep temperature gradient in the freezing range so the result is slow freezing and coarse graphite.

Fig. 7 represents a similar casting poured hot. The skin freezes rapidly at the start but not as rapidly nor as deeply as in the dull pour. Then the center section begins to feel the effects of the decrease in skin temperature and it begins to cool also. This beginning of the center to cool occurs high enough above the freezing range to permit of the establishment of a steep temperature gradient so that as the freezing range is approached the maximum rates of cooling has been established clear to the center of the piece. Hence, relatively more rapid freezing of the center of the casting occurs, resulting in a finer grained structure.

Cooling Rates Are Uniform

Reference to both curves, Figs. 6 and 7, shows that in the hot pour the cooling rates inside the piece are not only faster but they are more nearly uniform than in the dull pour. Fig. 8 shows schematically, the relative cooling rates of the various sections of the hot and dull poured castings, in the freezing range. The cooling rates are merely numbers representing the slope of the cooling rate curves of Fig. 6 and Fig. 7 in the freezing range. The greater uniformity of the cooling rates in the hot pour over the dull pour is noticeable, as are the faster cooling rates.

The practical demonstration of those views on effects of pouring temperature on rate of cooling in castings is shown in the quenching of steel. Given two pieces of steel, identical analyses, one of which is ½-inch diameter and the other 3 inches diameter, to be hardened. The ½-inch piece can be quenched just above the critical temperature and it will be hard throughout because the cooling rate of this small piece is fast enough. The 3 inches diameter piece must be heated to a much higher temperature before quenching so that the time necessary to develop the required speed of cooling for the hardness to extend throughout the piece is available otherwise the center will not be hardened.

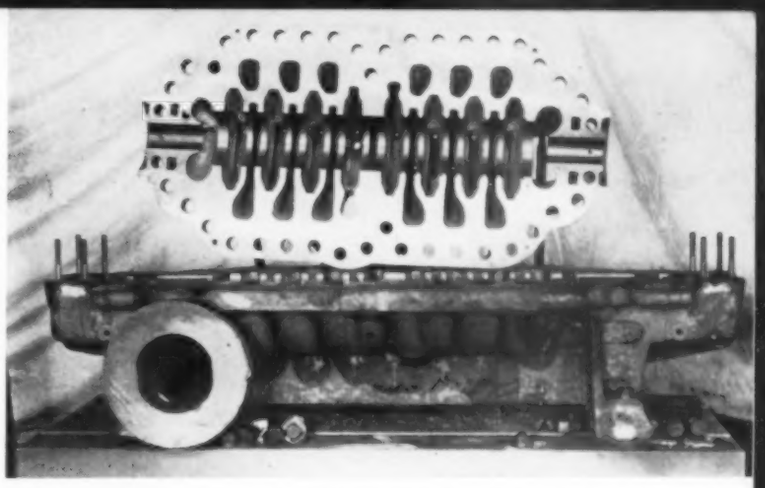


Fig. 9—Six-inch, 8-stage centrifugal pump casing operating at 1000 pounds per square inch pressure on gasoline

Practical experience has shown that results bear out that theory, at least, for the cast irons melted in the cupola. Since the rate of freezing affects both the amount and size of the graphite particles and since hot-pouring will cause rapid freezing, which in turn makes for a fine grained structure, all of our pressure castings are poured on the hot side.

Promoted Coarse Graphitization

We refer again to the experience which we had of holding iron in the ladle to cool it down. Adding the soft iron to the hard iron provided the graphite nuclei necessary to promote coarse graphitization. Holding the mixture provided ample time for any agglomeration of the graphite that might take place and brought about the low pouring temperature. We feel that the one-cupola process produces nonuniform results because the soft iron, both in the solid and liquid forms, carries graphitic carbon into the mixture too early in the process. If this soft iron could be obtained in the chilled form (that is, with the carbon mostly in the combined form in the pig) we would get better results.

As was stated at the beginning of this article the good results obtained with the two-cupola, low-carbon iron led us to consider our common one-cupola steel-mixes. These one-cupola steel-mixes, charged in the cupola first and therefore tapped out first, to avoid as far as possible the mixing with the soft iron charges which follow, are used in pump parts which operate at pressures between 200 pounds per square inch and 1000 pounds per square inch.

Charges for the steel mix-irons, or high test irons, melted all in one cupola, contain from 30 to 60 per cent steel rails, 3 per cent spiegeleisen and the remainder pig iron, one of which contains 2.25 per cent silicon and the other 3.50 per cent silicon. No scrap, of any kind is used. The amount of steel used is governed by the wall thickness of the castings to be poured. The thicker the wall section the lower the total carbon and therefore, the more steel rails per charge. This particular arrangement works out quite satisfactorily in our plant where it is applied to castings up to 2 inches thick.

The silicon content, determined by the pig iron used, is governed also by the wall thickness, from the machinability standpoint. The total carbons of the various mixtures vary between 2.80 and 3.25 per cent, and the silicon content between 1.50 and 2.00 per cent. The machinability of a ladle of iron for the particular jobs to be cast is determined by the depth of chill in a small bar, 1 x 2 x 6 inches cast, open sand, against a chill bar. The thicker the wall section the greater the depth of chill that is desired.

Formerly the various depths of chill were obtained by using a fixed steel percentage in the charge and varying the silicon content. In other words, the total carbon was reduced to a more or less fixed point, by using the same amount of steel rails in each charge, while the silicon was varied. When a deep chill was wanted the silicon was lowered and when a light chill was wanted the silicon was raised.

Leakers Were Definitely Higher

One objection to this system, was that the chill tests were likely to be erratic. The low silicon mixtures, intended for deep chills and therefore, heavy walled castings, were likely to give trouble. The machine shop would report certain castings as being hard, and they were very hard, even though the chill test for that particular ladle indicated that the analysis was about right. The leakers were definitely higher at that time also.

The present method is to vary both the silicon, which is about 50 points higher than formerly, and the total carbon. The chill tests run much truer to form with these mixtures. Experience has shown that the heavy walled castings from 1½ up to 2 inches thick, give best results on the pressure tests at 1000 pounds per square inch when the total carbon ranges from 2.80 to 2.95 per cent. The silicon then is held at 1.50 to 1.80 per cent. Incidentally, our experience checks closely with that of others that the lower carbon cast irons are not affected, as to unit strength, and grain size by rather appreciable variations in silicon.

In the two-cupola process the silicon has run as high as 1.80 per cent, when our standard has been 1.50 per cent without any apparent ill effects from softness and excessive graphitization. Decreasing the total carbon content of an iron mixture, everything else being equal, tends toward making the iron freeze as white iron. However, raising the silicon, in the lower carbon iron offsets this tendency. Incidentally, the ferrite formed is stronger because of the increase in silicon.

Fig. 9 shows an 8-stage centrifugal pump now operating at 1000 pounds per square inch on gasoline. The lower half casing weighs 2000 pounds and the upper half weighs 1400 pounds. The analysis of the iron in these castings is 1.65 to 1.80 per cent silicon; 0.12 per cent sulphur. 1.04 per cent manganese; 0.15 per cent phosphorus, and 2.90 to 3.00 per cent total carbon.

They do not leak when tested with kerosene at 1600 pounds per square inch pressure. They are operated at 1000 pounds per square inch on oil and gasoline so they must be quite free from internal defects of all kinds. The heavy parting flanges are 2½ inches thick, as cast, the wall thickness of the volutes is 1⅛ inches and the partitions between the various stages are 11/16-inch thick, as cast. The cored passages are intricate and the sections vary abruptly all through the casting.

As the wall sections decrease in thickness, the total carbon is increased by decreasing the percentage of steel rails per charge. The silicon may or may not be increased, depending upon the amount the total carbon is reduced. Castings measuring ¾-inch in thickness and tested at 500 pounds per square inch are made from iron analyzing 3.00 to 3.20 per cent total carbon and silicon between 1.85 and 1.90 per cent. Small parts that are from ½ to ¾-inch in section are poured with a mixture analyzing 3.15 to 3.25 per cent total carbon and 1.90 to 2.00 per cent silicon.

Silicon Content Is Increased

Compared to our practice of 7 or 8 years ago, our present high test iron practice calls for mixtures in which the silicon contents range from 40 to 60 points higher and the total carbon from 25 to 75 points lower. Our thoughts behind the use of higher silicon in the low carbon cupola mixes, are that, it can serve as a deoxidizer in the melt, and it also serves to prevent the low carbon irons from freezing out white.

Some experiments were run recently with all scrap mixtures in a 30-inch cupola. Silicon was added to the charge in the form of cement briquettes during one series. In the next heat a comparable amount of silicon in the form of lump and powdered 90 per cent ferro-silicon was added to the ladle. The iron was cast in chill molds. The analyses from the two heats showed: Briquettes in cupola—2.20 per cent silicon; 0.34 per cent combined carbon, and 3.40 per cent total carbon. Ferrosilicon (90 per cent) to ladle—2.15 per cent silicon; 1.07 per cent combined carbon, and 3.32 per cent total carbon.

The results were doubted and checks were made which were substantially the same as the original. Evidently the addition of silicon to the charge is more potent as a graphitizer, possibly because of its deoxidizing qualities. We feel that if the total carbon is lowered so that the silicon can be run at say, 1.75 per cent, instead of 1.25 per cent, the iron is benefited by the presence of this higher silicon in the charge.

So far this discussion has dealt entirely with steel rail-pig iron mixtures. The other type of iron used in our foundry is that in which no steel rails are used at all, it being a mixture of pig iron and scrap (*Please turn to page* 79)

GREEN SAND CORE FOR MAKING IRON PIPE

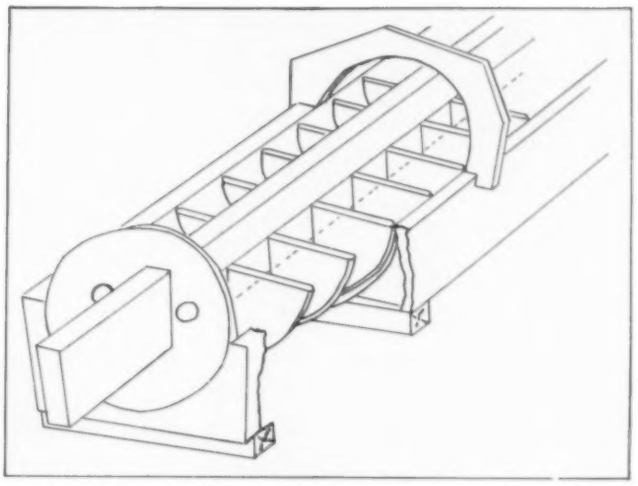


Fig. 2—Typical method of making green sand pipe core with half corebox and cast iron arbor

OCCASIONALLY a foundryman receives an order for a number of cast iron pipe in which the length or the thickness or some other special feature suggests the use of a green sand core as an economical factor. For example consider a pipe 5 feet in length, 11 inches inside diameter and only ¼-inch thick. If the foundryman has had no former experience with the use of green sand cores he may be at a loss to determine the required thickness of sand required on the barrel, thickness of the barrel itself, how the sand is held on the barrel, size and distribution of vent holes and many other items.

Where made properly, the green sand core presents many advantages over any other type. Expense is reduced by the elimination of binder and fuel and the continued use of the same material. The core is true to shape and size and therefore fits closely in the prints, thus eliminating unsightly fins and the cost of their removal. A strong arbor will prevent the core from springing in the center, thus insuring a uniform thickness of metal throughout the casting without the use of chaplets.

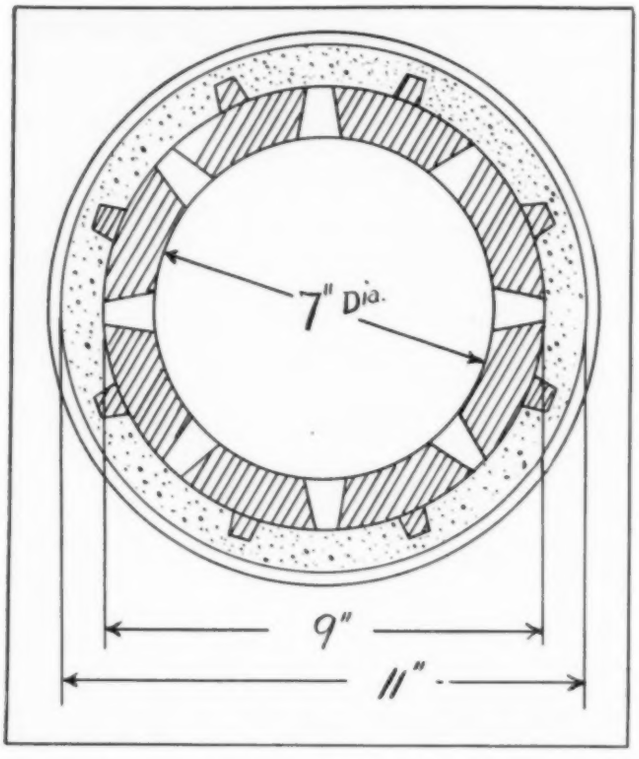


Fig. 1—Cross section of core and core barrel

Method of making green sand cores for pipe varies to some extent depending on whether a large or small number of castings are required. In a regular pipe plant where these castings are made on a production basis, the claywashed core barrel is mounted in an elementary type lathe. Sand from an overhead hopper falls from a distance of several feet in a long narrow stream on top of the revolving barrel. The impact is sufficient to make it stick. Superfluous sand is removed with a horizontal sweep or straightedge held in suitable guides to impart the desired shape and size to the core.

In a jobbing foundry where the extent of the order does not justify the installation of equipment of this kind, the core barrel is mounted in the cast iron ends of an empty drag and the sand is packed on by hand to approximately the desired thickness. Then the sweep is held in place by the molder while his helper slowly revolves the barrel with a crank handle attached to a tapered wood plug forced temporarily into the end of the barrel. The barrel is revolved downward toward the sweep and the molder adds a little sand here and there until the entire surface of the core is smooth and straight. Usually a light coating of blacking or plumbago is applied to the areas which later will appear immediately in front of the gates. A shallow shoulder approximately 1-inch wide is machined on each end of the barrel. The iron ends of the flask are machined to fit these shoulders accurately. (*Please turn to page* 76)

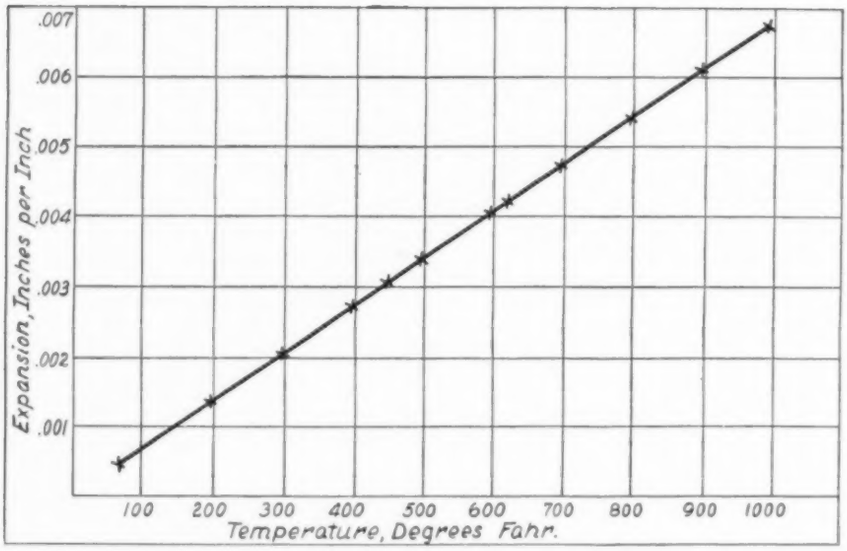


Fig. 123—Expansion curve of a gray iron with the relative amount of expansion indicated in inches per inch

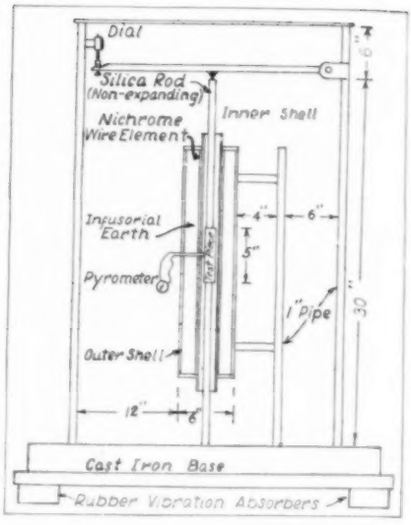


Fig. 124—Sketch showing the principal parts of a simple form of dilatometer to measure expansion

GRAY CAST IRON

By JOHN W BOLTON

Chapter XI (Continued)

General Physical Constants

WHEN a piece of gray iron is heated, it expands in a rather uniform manner. If certain temperatures are not exceeded, the metal resumes its original length and volume when the the temperature is brought back to normal. An expansion curve of a gray iron is shown in Fig. 123. The relative amount of expansion or of contraction, is indicated as the coefficient of expansion, or contraction. This expansion is determined on an instrument known as a dilatometer, a simple form of which is shown in Fig. 124. The coefficient of expansion differs somewhat according to the type of iron and the size of the test bar as cast. This is readily apparent from inspection of Table XVII.

Consequently it would appear that:

1. The stronger type irons have a greater expansion coefficient than the weaker types.

2. The small bars (¾ inch as cast) have a fairly high coefficient. At the 1-inch size this drops markedly. From this point on, increase in bar diameter apparently results in some increase in coefficient. However, in the first two cases, there is another decrease at the 3-inch bar.

Effect of increase in carbon in substantially pure iron carbon alloys, low silicon, as shown in Table XXI, based on work by Driessen. A comparison with other metals as shown in Table XIX is interesting, indicating what allowances must be made in composite structures (designs) when subjected to heat and cold, that is, expansion and contraction allowances between gray iron and these materials.

Table XVII

Coefficients of Expansion and Growth

Bar Size	Temperature Range Degrees Fahr.	Coefficient of Expansion × 10⁻⁶ ° Fahr.	° Cent.
Soft Cast Iron:			
1.2-inch turned to ¾-inch*	74 to 1000	7.21	12.98
½-inch	74 to 1000	7.37	13.27
¾-inch*	71 to 1000	7.36	13.25
1-inch turned to ¾-inch	68 to 1000	6.94	12.49
2-inch turned to ¾-inch*	74 to 1000	7.44	13.39
3-inch turned to ¾-inch*	71 to 1000	7.37	13.27
Cupola Semisteel:			
½-inch	76 to 1000	7.34	13.21
¾-inch†	84 to 1000	7.59	13.66
1-inch turned to ¾-inch†	75 to 1000	7.35	13.23
2-inch turned to ¾-inch†	84 to 1000	7.63	13.73
3-inch turned to ¾-inch†	72 to 1000	7.57	13.63
Low Carbon Iron:			
1.2-inch turned to ¾-inch‡	70 to 1000	7.47	13.45
2-inch turned to ¾-inch‡	70 to 750	8.30	14.94

*Carbon, 3.50 per cent; silicon, 2.15 per cent {phosphorus, 0.25 to 0.35 per cent,
†Carbon, 3.50 per cent; silicon, 1.70 per cent {manganese, 0.50 to 0.60 per cent,
‡Carbon, 2.80 per cent; silicon, 1.75 per cent {sulphur, 0.07 to 0.09 per cent.

It will be recognized that the probable relative expansions of certain structural components of gray iron are suggested by the above list—e.g. ferrite, pearlite, graphite and high cementite. A number of values are given in Table XVIII as assembled by Mochel.

In Fig. 125 is depicted the general direction of the contraction, and in some ranges, expansion of gray iron during cooling from the molten condition. The work of Keep, Turner, West and others on contraction of cast iron during cooling is familiar to all who have studied earlier researches. A chart based on some data of Turner's is shown in Fig. 126. That illustration shows contraction and expansion of pig irons and copper.

Data of the more recent work of Saeger and Ash—*Transactions*, American Foundrymen's Association, 1932—are shown in Table XX. Saeger and Ash determined the liquid contraction percentages, the shrinkage during solidification and the linear contraction of the solid metal. A pronounced expansion was noted as the irons cooled through 1958 degrees Fahr., both in gray and white irons. This Saeger and Ash attributed to a separation of dissolved gases during solidification.

The coefficient of volume shrinkage in the liquid state was constant at 0.006 per cent per degree Fahr. (0.011 per degrees Cent.). This confirms the earlier work of Schwartz. The volume change during solidification ranged from 1.65 per cent in a gray iron to 5.82 per cent in a low carbon white iron. (*Please turn to page* 80)

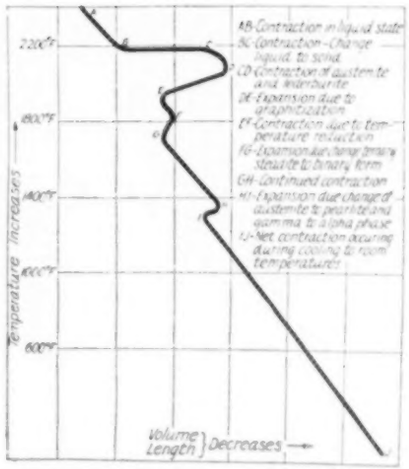


Fig. 125—Schematic representation of contraction and expansion

TABLE XIX

Coefficients of Expansion of Other Metals

Metal	Coefficient of Expansion × 10^{-6}	Temperature Range Degrees Cent.
Aluminum	25.9	20 to 200
Bronze, 90-10	17.1	20 to 300
Copper	16.7	250 to 300
Brass, 60-40	20.9	25 to 300
Pure Iron (Ferrite)	14.2	0 to 500
Pearlitic Steel (0.81 C)	13.8	20 to 500
White Cast Iron (3.8 C, 0.05 Si)	12.6	20 to 500
Graphite Carbon	2.4 to 3.5	0 to 400
Nickel (Commercial grade)	14.2	25 to 300
Manganese	21.6	0 to 300

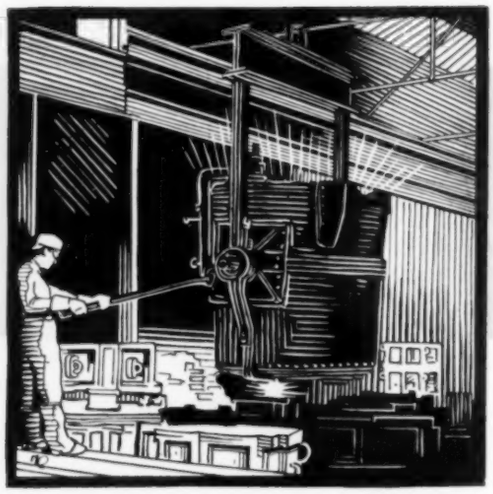
Authority—International Critical Tables.

Table XVIII

Coefficients of Expansion of Cast Irons

Chemical Composition, per cent								Linear Coefficient of Expansion per Degree Centigrade X 10-6 *a*												
Silicon	Phosphorus	Sulfur	Manganese	Combined Carbon	Graphitic Carbon	Total Carbon	Treatment	0 to 100° C. (32 to 212° F.)	0 to 200° C. (32 to 39° F.)	0 to 300° C. (32 to 570° F.)	0 to 400° C. (32 to 750° F.)	0 to 500° C. (32 to 930° F.)	0 to 600° C. (32 to 1110° F.)	100 to 200° C. (212 to 390° F.)	200 to 300° C. (390 to 570° F.)	300 to 400° C. (570 to 750° F.)	400 to 500° C. (750 to 930° F.)	500 to 600° C. (930 to 1110° F.)	600 to 700° C. (1110 to 1290° F.)	300 to 600° C. (570 to 1110° F.)	Reference
1.68	....	....	....	....	....	3.08	.....	8.4	....	11.6	....	....	....	11.7	14.2	15.6	14.3	Growing			Bureau of Standards No. 433
1.10	0.300	0.154	0.70	0.79	2.75	3.06	.....	11.1	11.6	12.2	12.7	13.2	....	....	....	....	....	....	....	....	Westinghouse Electric and Manufacturing Co.
2.00	0.255	0.151	0.93	0.66	2.46	3.12	.....	10.6	11.3	11.9	12.5	13.2	....	....	....	....	....	....	....	....	Westinghouse Electric and Manufacturing Co.
1.44	0.291	0.129	0.85	0.78	2.88	3.66	.....	10.4	11.1	11.7	12.3	12.9	....	....	....	....	....	....	....	....	Westinghouse Electric and Manufacturing Co.
0.11	....	....	0.17	....	....	1.67	Annealed at 1000° C. (1830° F.), ½ hour	10.4*b*	10.3*b*	11.4*b*	12.3*b*	13.1	13.7*b*	....	....	....	....	....	....	....	Driessen-Ferrum, Vol. 5 (1914)
0.08	....	....	0.15	....	....	2.24	Annealed at 1000° C. (1830° F.), ½ hour	0.6*b*	9.6*b*	11.0*b*	12.1*b*	13.2	....	....	....	....	....	....	....	....	Driessen-Ferrum, Vol. 5 (1914)
0.09	....	....	0.14	....	....	3.86	Annealed at 1000° C. (1830° F.), ½ hour	8.6*b*	8.8*b*	9.9*b*	11.3*b*	12.5	13.2*b*	....	....	....	....	....	....	....	Driessen-Ferrum, Vol. 5 (1914)
0.05	....	....	0.16	....	....	3.80	Annealed at 1000° C. (1830° F.), ½ hour	8.7*b*	8.5*b*	10.1*b*	11.5*b*	12.6	....	....	....	....	....	....	....	....	Driessen-Ferrum, Vol. 5 (1914)
....	....	....	....	....	....	3.00 to 4.00*d*	.....	....	....	....	....	....	....	....	....	....	....	....	....	....	International Critical Tables, Vol. II (1927)
3.37	....	....	....	....	....	3.12*e*	.....	....	....	....	....	....	....	....	....	....	....	....	....	....	International Critical Tables, Vol. II (1927)
1.65	1.30	....	0.20	....	....	3.04*f*	.....	....	....	....	....	....	....	....	....	....	....	....	....	....	International Critical Tables, Vol. II (1927)

a All values for Coefficient of Expansion are per degree Centigrade; to convert to corresponding values per degree Fahrenheit multiply by 5/9.
b Instantaneous coefficient of expansion.
d Linear coefficient of expansion per degree Centigrade:—191 to 16° C. (—312 to 61° F.) 8.5.
e Linear coefficient of expansion per degree Centigrade: 0 to 700° C. (32 to 1290° F.) 8.3.
f Linear coefficient of expansion per degree Centigrade: 0 to 1000° C. (32 to 1832° F.) 13.3.



Questions and Answers

This department includes problems relating to metallurgical, melting and molding practice encountered in making castings. Questions from subscribers addressed to the Editor of The Foundry will be answered by members of the editorial staff, supplemented where occasion requires by the advisory staff.

Top of Hollow Bronze Nut Shows Defective Pin Hole Area

We are forwarding a hollow bronze nut which apparently is satisfactory except for a great number of small pin holes around the top edge. We shall appreciate your opinion on the cause and cure of that form of defect.

The defect is caused by a slight commotion in the metal as it rises between the inside green sand core and the outside wall of the casting, particularly as it covers the shoulder of the core. The sand either is a little too damp or rammed a little too hard, or possibly a combination of both. As a precautionary measure we suggest running a ¼-inch vent wire through the cope and through the center of each core.

Requires Alloy Which Will Withstand Storage Battery Acid

Can you supply us with a mixture that will withstand the acid of storage batteries? At present we are using yellow brass. We understand that lead is a good anti-acid metal, but we want something harder.

Presumably you are making terminals for batteries, and it is our opinion that lead or a lead-antimony alloy is the most suitable composition for that purpose. While it is true that it is not as strong as other alloys, the only thing it has to withstand along that line is the drawing up of the bolt through the slotted side. However, the metal will give enough so that there is little chance of fracture even when the bolt is drawn tight.

An alloy composed of 92 per cent lead and 8 per cent antimony will be harder than just lead alone. However, if you want to use a copper base alloy, there are a number of bronzes high in copper which are corrosion resistant. For example, the 88 per cent copper, 10 per cent tin, and 2 per cent zinc alloy, known as gun metal or admiralty metal can be used with sulphuric acid. Also you might want to try pure copper to which 2 per cent zinc is added so that it can be poured satisfactorily.

Soldering Furnace Castings Must Resist Heat and Corrosion

We have an inquiry on castings for a soldering furnace which must be made of rust-proof metal or supplied with a noncorrosive finish. Bearing in mind that some of these castings will be subjected to heat, can you give us any information along that line?

A definite reply to your inquiry on castings for a soldering furnace which must be rustproof is not easy to give because not enough information is given on what the castings are, their location with respect to elevated temperature, and if the corrosion resistant term means that a bright surface must be maintained. Therefore, only a few suggestions can be made as to possibilities of meeting the requirements.

One means that might be satisfactory is to use an alloy iron containing about 15 per cent nickel, 7 per cent copper 2 per cent chromium in addition to the usual elements found in high grade gray iron. Another method would be to employ an alloy iron containing 20 to 35 per cent chromium.

Both irons mentioned are corrosion and heat resisting alloys, but whether they will retain a bright finish under the particular service conditions cannot be answered without some investigation. A third possibility would be to use an alloy iron containing small amounts of nickel and

chromium in the required proportions to give heat resistant qualities, and then plate the surface with metallic chromium electrolytically. Again, some experimental work would be required under service conditions to see how the chromium plating would stand up.

Mixtures Can Be Melted In Same Type of Iron Pot

We are making 3-ounce aluminum castings in sand molds and want to change to white metal since the castings are to be polished and used merely for decorative purpose. Can we use white metal for this purpose, and if so what changes are necessary?

Molding, melting and pouring practice is the same for aluminum and white metal in the event that you are melting the aluminum in an iron pot, except that the temperatures are lower, and the pot perfectly clean. All lead-tin-antimony alloys are known as white metal. The mixtures range in almost endless combinations from lead 93 per cent, tin 3 per cent, antimony 4 per cent, to lead 5 per cent, tin 75 per cent, antimony 20 per cent. For certain small castings the latter mixture is used extensively, but is expensive on account of the high tin content. In the present instance it is possible that a metal known as coffin trimming will meet your requirement. This alloy contains lead 83 per cent and antimony 17 per cent.

White Iron May Be Melted Satisfactorily in Several Units

We are anxious to keep our white iron foundry operation separate from gray iron and having 8 ounces of air pressure and oil available, we are wondering if we can melt white iron satisfactorily and economically in an oil furnace. Our tonnage probably would be between 1000 and 1500 pounds per day with the charge ranging between an all malleable scrap charge to a high chromium mix.

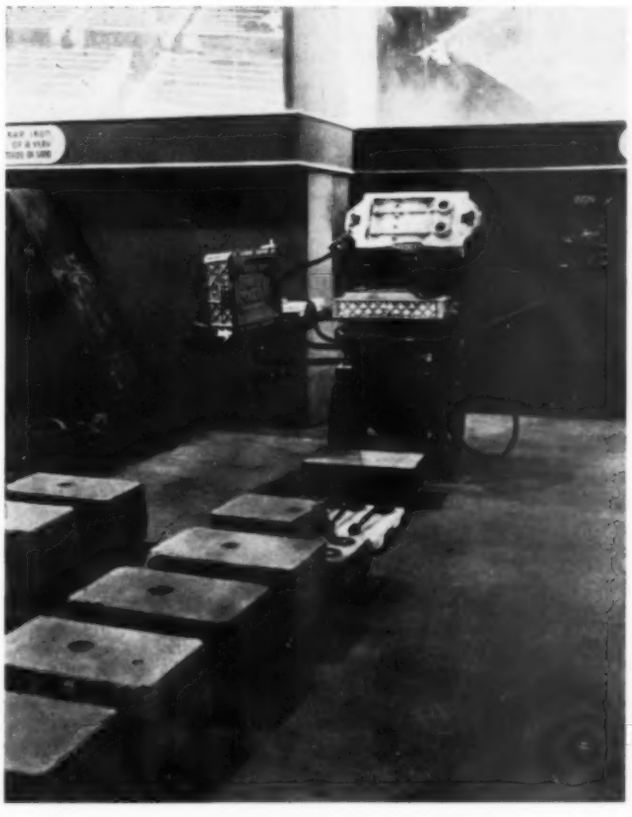
Your idea to keep two types of iron separate is a good one, and there are several melting methods available including the oil furnace you mention. Your white iron can be melted satisfactorily in the oil furnace, but not as economically as in the cupola. However, the oil furnace offers possibilities in greater control and that may offset the higher melting cost. The type of furnace suggested for melting is the open-flame type which can be obtained from several manufacturers.

Other methods of melting that will be worth looking into are a small cupola of 20 or 22 inches inside diameter; the powdered coal, rotating furnace, and a small electric furnace. Each type of unit has its desirable features and the manufacturers of them, whose names may be found in the advertising section of THE FOUNDRY, will be glad to supply you with detailed information.

Steel and Wrought Iron Cupola Melted Become Cast Iron

According to available literature the melting point of cast iron is about 2000 degrees Fahr.; steel about 2500 degrees Fahr., and wrought iron about 3000 degrees Fahr. Since that is so, why do not some foundries cast grate bars, stoker bars, etc., from mixtures made with wrought iron scrap instead of pig iron and common scrap?

While it is true that steel and wrought iron have higher melting points than cast iron, due to their low contents of elements such as silicon, manganese, and particularly carbon, their melting points are in general decreased through increase of the elements mentioned. Consequently, when steel or wrought iron is melted in a cupola which of course is the lowest cost melting unit, it picks up carbon due to its intimate contact with red hot coke. That pick-up of carbon will depend on a number of factors, but generally ranges from 2.50 to 3.0 per cent. As a result of that carbon pick-up, the original material becomes cast iron.



Revision in the foundry exhibit which forms a part of the Romance of Iron and Steel at the Great Lakes Exposition, Cleveland permitted the addition of a machine molding floor. Machines, equipment, molds and castings were supplied by Osborn Mfg. Co., Hines Pattern & Mfg. Co., Cleveland Co-operative Stove Co. and Fulton Foundry & Machine Co., Cleveland

Aluminum Is Good Yellow Brass Cleaner

We are using aluminum in yellow brass now with satisfactory results except for formation of dross and porosity. Neither of these bother us on usual productions of small hardware types of reproductions; but on job lots and larger castings we have some trouble. We have used phosphor copper also but the results have not been satisfactory. We have been using principally scrap metal which has been purchased in selective lots. However, we do not feel that that is the trouble because even when using ingot metal we still had the same difficulties. We are using a small gas fired crucible furnace and have experimented with our mixture. Any recommendation would be greatly appreciated.

For cleansing yellow brass, aluminum has proved satisfactory in castings where pressure resistance is not required. It has been noted that by adding some new zinc to the alloy after it is molten and before adding the aluminum, some of the troubles experienced with the use of aluminum are minimized. The amount of aluminum is most important. Too much gives rise to troubles that can be overcome entirely by a reduction of the percentage used. No one can prescribe the exact percentage required since that is determined by the kind of work at hand and the conditions existent in the particular foundry. Some of the proprietary fluxing compounds are helpful because they do contain some aluminum.

The best practice is to use just as little aluminum as will clear up the bath and make good clean, sound castings. By adding approximately 1 per cent of new zinc to the bath first and then following with an addition of a small amount of aluminum, we believe you will have the most satisfactory results. You should experiment to determine just how little aluminum you can use to obtain the desired results as the use of the minimum amount will help to avoid troubles caused by too much aluminum in the metal. If you are manufacturing castings that must withstand a water test, the presence of aluminum is not permissible as it tends to cause leakage through the casting in some spots.

Yellow brass can be cast without any flux, or at least without any aluminum present. This must be done by those experienced in the handling of such material. Pouring must be done just right and the temperature controlled so as to insure satisfactory results. Wherever possible, yellow brass should contain a small amount of aluminum as it reduces foundry troubles materially, including smoke in the room, smoke spots on the castings, etc. Therefore, if the work will permit the presence of aluminum, it should be used, but it must be used intelligently.

Desire Wrinkle On Surface of Ingot

Can you give us some information on the nature of the wrinkle on linotype metal? We are making linotype ingot metal containing 5 per cent tin, 12 per cent antimony and 83 per cent lead, and cannot get the wrinkle on the top surface as is usual on metal of that composition.

The linotype metal you refer to generally is called standard, and we understand that it is an excellent material. However, we are told that the wrinkle or wavy surface on top of the ingots will not appear if the tin content is greater than 3½ per cent. Linotype metal containing 3¼ per cent tin, 11½ per cent antimony and 85 per cent lead will show the wrinkle as you term it, but with a tin content of 4 per cent and an antimony content of 12 per cent, the wrinkle is absent. The 3½ per cent tin alloy is considered a good grade of linotype metal, even though it will be a little cheaper to make due to its lower tin and antimony contents. Therefore, if it is necessary that your ingots show a wrinkle or wavy surface, it may be advisable to change to that alloy. However, due to the lower tin content the linotype will not wear quite as well as that with 4 or 5 per cent tin.

Figure Melting Loss in Foundry Cupola

What is the average melting loss in a gray iron cupola? We charge a mixture of 55 per cent machinery scrap and 45 per cent pig iron. Most of the scrap is rather rusty.

As the result of an extended series of experiments, the late Dr. Moldenke, in *Principles of Iron Founding* presents the following figures as representing the average melting loss of the several kinds of foundry iron going into ordinary mixtures: Machine cast pig iron 0.30 per cent; sand cast pig iron 1.00 per cent; car wheels 2.00 per cent; first quality machinery scrap 2.50 per cent; light machinery scrap 3.50 per cent; stove plate scrap 8.00 per cent. The foregoing represents very painstaking work and a strict accounting of all the iron entering the cupola and the loss actually sustained in melting, that is the loss in weight incident to converting metal from the solid to the liquid state.

In ordinary foundry routine several other factors must be taken into consideration to account for the discrepancy between the weight of metal charged into the cupola and the amount recovered in castings, gates, sprues and scrap. A certain amount of iron passes off with the slag either in combination or as free iron. In some foundries this free iron is recovered, but in others it is taken to the dump with the slag. The same obtains with recovery of iron from the cupola drop. A certain amount of iron is spilled in pouring and never is recovered, unless the sand is put through a magnetic separator. Absolute accuracy rarely is attained in making up the cupola charges. Thus while the charging sheet might show that 20 charges each containing 2000 pounds entered the cupola, it is possible that each charge may be short 20 pounds of the actual weight, thus accounting for a discrepancy of 400 pounds in the final check up. In your particular case and operating under ordinary conditions the average melting loss will be about 5 per cent.

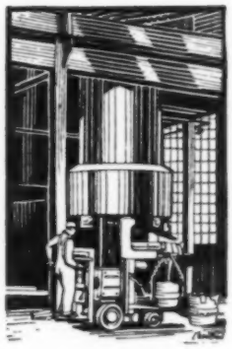
Gives Mixtures For Grinding Burrs

We are sending you a section broken from a feed grinder plate or burr. We want to make these in our foundry, and would like to know if you could supply us with a sound formula for white cast iron as that is what the enclosed sample is supposed to be.

A variety of mixtures is available for making grinder plates, and these are made with and without alloy additions. For example, one without any alloys is made up of 50 per cent malleable bessemer pig iron containing 1 per cent silicon; 15 per cent gray iron scrap containing about 2 per cent silicon; 20 per cent return white iron scrap containing about 0.75 per cent silicon, and 15 per cent steel scrap containing about 0.05 per cent silicon. Another containing chromium is made up of 30 per cent steel scrap, 20 per cent return scrap, and 50 per cent pig iron with the addition of from 3 to 5 per cent ferrochromium. A third mixture contains from 4.25 to 4.75 per cent nickel and 1.40 to 2.25 per cent chromium with a silicon content around 1.40 per cent.

Method of molding grinder disks or burrs is not difficult, except that the design of the corrugations on the surface will determine whether a green sand mold can be used or whether the mold should be skin dried, or completely dried. Due to the sharp edges shown in the specimen submitted, we believe that you will find it necessary to skin dry the molds at least.

White cast iron must be melted hot, and handled rapidly, and poured quickly, otherwise it becomes too thick to pour satisfactorily. When steel scrap is used in the mixture, it is advisable to install a mixing ladle at the cupola spout to insure uniform metal. The alloys may be added in the cupola or at the spout.



Viewing Foundry Developments . . . AT SHORT RANGE

ONE of the leading automotive manufacturers running into considerable difficulty in removing the water jacket cores in his cylinder blocks, hurdled the complications in a characteristic fashion. Instead of closing off the water jackets at the crankcase as is usual, the cores are arranged so that they extend to the crankcase core, and leave passages from the water jackets into the crankcase. That arrangement permits the core sand to be removed easily, and the passages then are sealed by welding a steel strip, the length of the block, over the openings.

♦ ♦ ♦

A recent development of a Middlewestern firm is a fluid for breaking obstinate and corroded joints, bolts and studs. The fluid has no lubricating value, but is claimed to penetrate rapidly into the threads of joints to be broken where it breaks the rust down into a fine powder.

♦ ♦ ♦

One enterprising foundryman has found that he can save considerable coke on short heats by completely draining the cupola before dropping the bottom. To insure adequate draining he has made a hole about 4 or 5 inches in diameter in the bottom doors to permit piercing through the sand bottom with a heavy rod bent at right angles on the end. After the molten iron and slag have drained out and solidified, they are hauled away, and then the bottom is dropped. As a result, the bed coke comes out clean and is used the next day. Also due to the fact that there is no molten metal or slag present, a heavy stream of water can be played on the drop without any danger.

♦ ♦ ♦

A fine pearlitic structure may be obtained in pearlitic malleable irons containing 2½ per cent carbon, 1½ per cent silicon and 0.35 per cent manganese by heating it to 1725 degrees Fahr. and holding for 4 hours. Cool in the furnace to 1250 degrees, preferably at the rate of 75 degrees per hour, and then without removing the material from the furnace, increase the temperature to 1500 degress Fahr., and air quench. As mentioned previously, the heat treatment cycle produces a fine pearlitic structure.

♦ ♦ ♦

A FOUNDRY making pressure castings from a nickel silver alloy containing 65 per cent copper; 5 per cent lead; 4 per cent tin; 6 per cent zinc, and 20 per cent nickel had trouble with leakage under hydraulic test. The metal was deoxidized with 0.10 per cent manganese in the form of 30 per cent manganese-copper, introduced a few minutes before lifting the crucible from the furnace, and with 1 ounce of metallic magnesium per 100 pounds of metal immediately before pouring. The metal was poured at approximately 2350 degrees Fahr. Investigation indicated too low a pouring temperature, so the practice was changed to superheat the metal to about 2500 degrees Fahr. before adding the manganese and magnesium, which eliminated the trouble.

♦ ♦ ♦

Aluminum alloy permanent mold castings are finding increasing use in vacuum cleaners, washing machines, bicycles and various household implements since that method of production is claimed to provide a fine-grained, homogeneous material free from porosity and capable of taking a fine polish.

♦ ♦ ♦

Cylinder blocks in one automotive plant are made from a hard iron or semisteel mix which is composed of 35 per cent steel scrap; 11 per cent foundry pig; 12.2 per cent malleable pig; 10 per cent briqueted borings; 25.2 per cent remelt, and 6.6 per cent of a nickel-chromium bearing pig iron. Cylinder heads, flywheels, etc. are made from a combination of that iron and a soft iron melted in another cupola so that the resultant iron is comparable to a 20 to 25 per cent steel mix. The soft iron is comprised of 6.8 per cent steel scrap; 3.5 per cent foundry pig; 43 per cent malleable pig; 5 per cent briqueted borings; 3 per cent foreign cast iron scrap; 35 per cent remelt, and 3.7 per cent high silicon pig.

♦ ♦ ♦

AN INGENIOUS Middle west gray iron foundryman has developed a mechanical method for lining his hand ladles which presents many features of superiority over the usual hit or miss hand lining method. The empty hand ladle is placed in a hinged clamp on an old drill press table. A double handful of lining material is placed in the bottom of the ladle. The drill press spindle equipped with a cast iron form the shape of the inside of the ladle then is lowered. The spinning form forces

the mud against the bottom and sides of the ladle, while the superfluous material falls over the top on the outside. An automatic stop regulates the thickness of lining material on the bottom of the ladle. In advance a number of lip pieces are made in a metal corebox and dried. One of these lip pieces is pressed by hand into the wet mud at the top of the ladle. The entire assembly then is dried in the oven. The device has been in use for many years with the original former showing no sign of wear.

Victor W. Ellet

Elbert J. Fuller

Rudolph Furrer

H. Fleishour

Men of Industry

VICTOR W. ELLET has been elected president and general manager of the Hunt-Spiller Mfg. Corp., Boston. He was born in Burlington, Iowa, in 1880 and six years later removed with his parents to Fort Madison, Iowa, where he was educated in public schools and Johnson's business college. Mr. Ellet completed his apprenticeship as machinist with the Atchison, Topeka & Santa Fe railroad at Fort Madison in 1901. From this time until 1911 he was affiliated with different railroads in several capacities, also working as a tool maker in the United States government arsenal at Rock Island, Ill. In 1906 he served as an executive in the mechanical department of the Chicago, Rock Island & Pacific railroad. Mr. Ellet entered the employ of the Hunt-Spiller corporation in 1911 as mechanical representative, was appointed sales manager in 1925, vice president in 1928 and was elected to his present position Aug. 27. He is a member of the executive committee of the Railway Supply Manufacturers association, a member of the New England Railway club, the Engineers Club of Boston and various other organizations.

ELBERT J. FULLER has been elected vice president of the Hunt-Spiller Mfg. Corp. Born in Clinton, Iowa, he entered the service of the Chicago & Northwestern Railway Co. at an early age as machinist's apprentice. Later he was appointed to a supervisory position in the mechanical department. During the years 1911, 1912 and 1913 he was chief inspector of new equipment for that railway at the American Locomotive Co. plant in Schenectady, N. Y. Mr. Fuller entered the Hunt-Spiller Mfg. Corp. in 1914, serving as mechanical representative until his appointment as assistant sales manager in 1927. He held this position for one year before he became sales manager, a position which he will continue to hold in addition to his new duties.

♦ ♦ ♦

H. FLEISHOUR has resigned his position as general foundry foreman, Davenport Machine & Foundry Co., Davenport, Iowa, to become superintendent of gray iron and malleable foundries, Great Lakes Malleable Co., Milwaukee. He started as an apprentice in Canton, O., in 1905, worked in several plants in that city and later moved to Chicago. Mr. Fleishour became connected with the W. A. Jones Foundry & Machine Co., Chicago, and was appointed to the position of assistant foreman. In 1928 he became foreman of the Foote Bros. Gear & Machine Co. foundry in Chicago, moving back to Canton three years later to a position with the Bosshardt steel foundry. Later Mr. Fleishour returned to the W. A. Jones company, going from there to his connection with the Davenport Machine & Foundry Co.

♦ ♦ ♦

RUDOLPH FURRER has been appointed industrial engineer of the manufacturing department of Allis-Chalmers Mfg. Co., Milwaukee. In 1907 he was employed at the former Scranton plant of the company, being transferred in 1911 to the West Allis works where he was engaged in drafting and engineering work. In 1918 Mr. Furrer joined the A. O. Smith Corp., Milwaukee, as mechanical engineer. During the World war he was connected with the aviation division of the United States Naval Reserve Corps. Later Mr. Furrer became supervisor of construction at the A. O. Smith Corp. and from 1927 to 1932 held the position of chief engineer and director of research. He then became affiliated with the National Tube Co., acting as assistant to the vice presidents for three years, prior to his recent appointment with the Allis-Chalmers company.

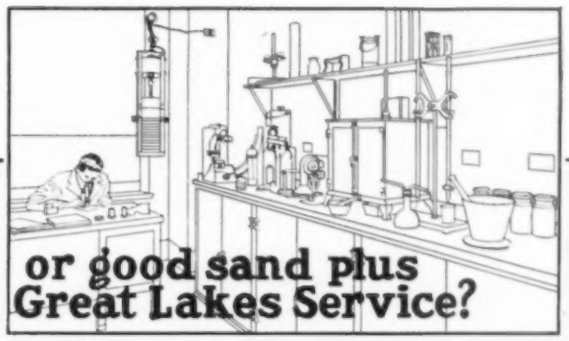
♦ ♦ ♦

CHARLES A. BIGELOW has been elected a vice president and member of the executive committee of Hercules Powder Co., Wilmington, Del. Born in Schohaine, N. Y., he was graduated from the University of Vermont, later doing graduate work at Harvard college. Mr. Bigelow was general manager of the Aetna Explosives Co. until 1921 when that company was purchased by the Hercules company. After the consolidation he was placed in charge of explosives operations and when the company was departmentalized in 1928 he became general manager of the explosives department.

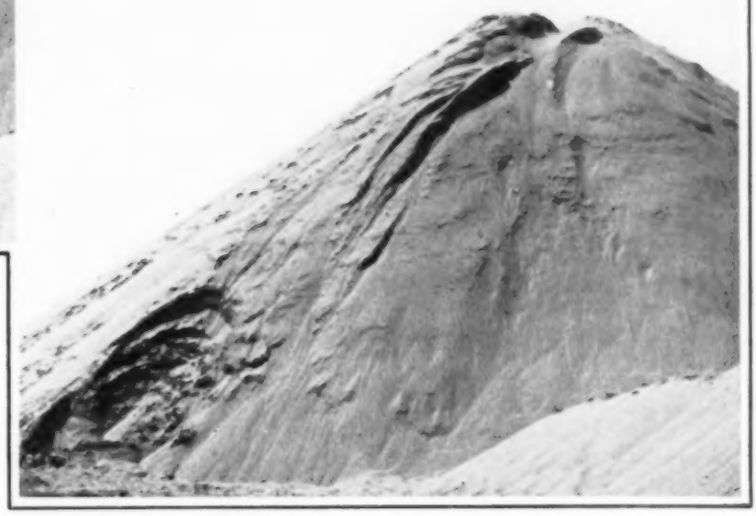
MAHLON GEORGE MILLIKEN, general manager of the cellulose products department of the company, was elected a director. WILLIAM ROBERT ELLIS, formerly assistant general manager of the explosives depart-

(*Continued on page* 40)

Just sand–



or good sand plus Great Lakes Service?



What do you get for Your Sand Money?

Do you get—just sand?

Or do you get good sand, with technical service that helps you produce better castings, with better finish, in less time, with minimum scrap?

We sell sand, most of it from our own deposits, all of it mined under ideal conditions, handled with scrupulous care.

But we deliver more than sand. We offer every customer foundry, metallurgical and sand blast engineering service. This service applies to core room, cupola, molding floor and cleaning room. It has proven invaluable to scores of large and small foundries—in the United States and Canada.

When next you need sand, try Great Lakes sand—plus Great Lakes Engineering Service, at no extra cost.

The Great Lakes Line

Molding Sands
Bank Core Sands
Lake Core Sands
Crude Silica Sands
Ottawa Silica Sands
Silica Flour
Great Lakes Coroil
Bentonite
Clay Bond
Fire Brick
Nepheline Syenite
Refracto Fire Clays
Refracto Firestone
Mica Schist
Ganister-Silica Grits
A B C Foundry Coke

BLAST SANDS

Diamond
Flint Shot
Gem Quartz
Muscatine
Gold Jacket

Steel and Metallic Abrasives
Alloy Iron Nozzles
Stoody Borium Nozzles
Mill Stars
Limestone
Dolomite

Great Lakes Foundry Sand Co.

UNITED ARTISTS BUILDING

Detroit, Michigan

Foundry, Metallurgical and Sand Blast Engineering Service

(*Continued from page 38*)

ment, has been named general manager, succeeding Mr. Bigelow.

♦ ♦ ♦

ALEXANDER HAIGH, 141 Milk street, Boston, has been appointed representative in the New England states by the W. W. Sly Mfg. Co., Cleveland.

♦ ♦ ♦

BRADLEY STOUGHTON, formerly director, curriculum of metallurgical engineering, has been made dean, college of engineering, Lehigh university.

♦ ♦ ♦

HOYLE JONES, formerly president, Superior Tube Co., has been appointed district sales manager, Republic Steel Corp., with headquarters in Tulsa, Okla., filling the vacancy left by the late C. S. Powers.

♦ ♦ ♦

PERCY R. GARDINER, Toronto, Ont., has been made vice president of Edge Moor Iron Works Inc., Edge Moor, Del., new name of the company acquired by Thomas J. Dillon and associates, New York.

♦ ♦ ♦

CLARK B. CARPENTER, metallurgist, has been appointed head of the department of metallurgy, Colorado School of Mines, filling the vacancy caused by the death of Irving A. Palmer.

♦ ♦ ♦

E. A. STEIF, for many years manufacturer's agent in the east for Otis Steel Co., Cleveland, has been appointed manager of sales for the company's newly-opened office in the New York district.

♦ ♦ ♦

DR. J. C. WARNER, associate professor of theoretical chemistry and for the past 10 years a member of the faculty of the chemistry department at Carnegie Institute of Technology, has been appointed associate professor of metallurgy.

♦ ♦ ♦

L. E. MUSTARD has been appointed district manager of the Detroit office of the Bristol Co., Waterbury, Conn. He attended the University of Michigan and started his business career with the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

♦ ♦ ♦

A. C. GOODNOW, formerly president of the Standard Silica Co., Chicago, has joined the White Rock Silica Co., Chicago, as vice president. Mr. Goodnow, who was associated with the Standard company for 12 years, will be identified with the production and sales departments of the White Rock company.

♦ ♦ ♦

WALTER E. REMMERS has been appointed assistant to S. C. DUTOT, district manager of sales in Chicago for the Electro Metallurgical Sales Corp., New York. He was associated formerly with the Western Electric Co., Chicago, and is a graduate of the school of mines and metallurgy, University of Missouri.

♦ ♦ ♦

J. W. GLEASON, formerly general manager, Knapp Bros. Mfg. Co., Joliet, Ill., has been appointed Chicago district manager of the Rawlplug Co. Inc., New York. Mr. Gleason was assistant general sales manager of Kalman Steel Corp., Bethlehem, Pa., for five years. He acquired sales engineering experience with the General Fireproofing Co., Youngstown, O., for seven years and prior to that he was connected with the Northwestern Expanded Metal Co. and Link-Belt Co., Chicago.

♦ ♦ ♦

DR. LEO HENDRIK BAKELAND, president and founder of the Bakelite Corp., New York, has been presented an honorary membership by the Royal Society of Edinburgh, Scotland. Dr. Bakeland is known best for his invention of resinoid in 1909, a plastic material which has contributed much to the development and growth of many basic industries. In 1905 he was instrumental in the development of the Townsend electrolytic cell for the Hooker Electrochemical Co. He is also the inventor of Velox photographic paper.

♦ ♦ ♦

J. B. BROWN, formerly steel foundry superintendent, Walworth Valve & Fitting Co., Greensburg, Pa., recently has become foundry superintendent, Oklahoma Steel Castings Co., Tulsa, Okla. Mr. Brown's early years in the steel foundry were spent with the Kelly & Jones Valve & Fitting Co., Greensburg, Pa., as a steel melter. Later he was made steel foundry foreman. When the Walworth Valve & Fittings Co. took over the plant of the Kelly & Jones Valve & Fitting Co., Mr. Brown remained on in the same capacity. In 1928 he was made steel foundry superintendent of that company.

♦ ♦ ♦

WILLIAM STARLING SULLIVANT RODGERS, president of the Texas Co., distributor and refiner of Texaco gasoline and oils, has been made a member of the board of directors of the Jeffrey Mfg. Co., Columbus, O. R. L. COX has been elected a vice president in charge of mining sales and C. R. HELLER has been named vice president in charge of conveyor sales. J. F. DAVIDSON, assistant to the president for several years, has been elected a vice president, his former post having been discontinued. WALTER JEFFREY has resigned as a vice president of the company but will continue as a member of the board of directors.

♦ ♦ ♦

A. R. ELLIS recently has been appointed president and director, Pittsburgh Testing laboratory, Pittsburgh. Mr. Ellis is a native of Pittsburgh. He graduated from Cornell university, Ithaca, N. Y., in 1905 with a degree in civil engineering and in the same year entered the employ of the Pittsburgh Testing laboratory as a laboratory technician. He later became an inspector of engineering materials and finally, in 1910, chief engineer. Then followed the successive positions as manager of the New York branch, assistant general manager, general manager and director, and vice president.

♦ ♦ ♦

THOMAS CRUTHERS has been appointed vice president of the Worthington Pump & Machinery Corp., Harrison, N. J. Mr. Cruthers is a graduate of Stevens Institute of Technology, holding the degree of mechanical engineer. His first position was with the Westinghouse Machine Corp. as superintendent of gas engine erection. In 1907, in the same capacity, he joined the Snow Steam Pump Works, Buffalo, a Worthington subsidiary. Transferred to the Worthington company sales department in 1908, his first assignment was to the Pittsburgh territory and subsequently to various other districts until 1927. In 1927, Mr. Cruthers was appointed New York district sales manager, in 1930, assistant general sales manager and two years later, assistant vice president in charge of sales.

♦ ♦ ♦

HAROLD L. HOLTZ, controller of the Sivyer Steel Casting Co., Milwaukee, has been elected a vice president of the company.

WILLIAM F. STREMKE, formerly assistant to the president, has been elected assistant secretary.

♦ ♦ ♦

G. A. FRITSCHI, formerly purchasing agent for the Vanadium Corp. of America, Bridgeville, Pa., and the Southern Mineral Products Corp., has been named Pittsburgh district sales manager for the Vanadium corporation, succeeding J. ALFRED MILLER.

♦ ♦ ♦

CHARLES J. GASKELL has been appointed representative in Memphis, Tenn., for the Modine Mfg. Co., Racine, Wis., manufacturer of unit heaters, copper radiation, unit coolers and heat transfer equipment. He will cover the western part of Tennessee, northern part of Mississippi and eastern part of Arkansas. His office is located in the Falls building, Memphis.

♦ ♦ ♦

C. A. KELLEY, Southern Sierras Power Co., Riverside, Calif., has been elected president of the National Association of Purchasing Agents. At the organization's twenty-first international convention held at Hotel Roosevelt, New Orleans, La., Mr. Kelley succeeded FRED J. LUCAS, Purdy-Mansell Ltd., Toronto, Canada.

The following district vice presidents were elected to serve with Mr.

(*Concluded on page 44*)

ADVERTISING PAGES REMOVED

OFFERS MORE

TIME-TESTED DEPENDABILITY

(left) 212J—Osborn Jolt Squeezer. Post type. 12″ squeeze cylinder diameter.

214J—Osborn Jolt Squeezer. Post type. 14″ squeeze cylinder diameter.

(right) 212PJD—Osborn Jolt Squeezer. Post type with double squeeze head. 12″ squeeze cylinder diameter.

TO USERS OF JOLT SQUEEZERS

More than the complete line of Osborn Jolt Squeezer Moulding Machines . . . more than the many noteworthy improvements . . . more than their outstanding values is their TIME-TESTED dependability . . . a factor which makes the Osborn line the standard of comparative values. Write for full information and quotations on Osborn Jolt Squeezer Moulding Machines.

THE OSBORN MANUFACTURING COMPANY

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Agencies located strategically throughout the world

OSBORN

(*Concluded from page 40*)

Kelley: WAYNE R. ALLAN, Oakland, Calif.; H. M. LINGLE, Houston, Tex.; GEORGE A. NEEDHAM, Chicago; A. J. MITCHELL, Grand Rapids, Mich; W. ALLEN TRAILL, Montreal, Canada; ARTHUR J. GOETZ, Monroe, Mich.; H. C GREEN, Birmingham, Ala.; GEORGE M. TISDALE, New York, and GEORGE P. BROCKWAY, Southbridge, Mass. These men, together with Mr. Lucas, comprise the executive committee for the coming year.

♦ ♦ ♦

DR. ARNOLD P. HOELSCHER, for the past 4 years connected with the division of metallurgy, University of Iowa, has joined the chemical engineering faculty at Purdue university, Lafayette, Ind., as assistant professor of metallurgy. He will conduct courses in principles of metallography, heat treatment, advanced metallography and alloy systems. Dr. Hoelscher received his B. S. in chemical technology in 1923 at Iowa State college, Ames, Iowa, and his Ph.D. in 1930 from the same institution. While at the University of Iowa, Dr. Hoelscher was on leave of absence for several months, during which time he worked as metallurgist at the Rock Island Arsenal, Rock Island, Ill. His experience also included work in several malleable iron plants on the development and production of malleable iron by the two-stage annealing cycle, as well as at the DuPont Ammonia plant in Charleston, W. Va.

♦ ♦ ♦

FRANK CORDES, senior vice president, Blaw-Knox Co., Pittsburgh, has been elected president of that company succeeding the late Irvin F. Lehman.

CHESTER H. LEHMAN has been elected senior vice president of the Blaw-Knox Co. and GEORGE L. DUMBAULD has been made a vice president in addition to his position of treasurer. All other officers remain the same.

Mr. Cordes has been elected chairman of the board of each of the Blaw-Knox subsidiaries, and Mr. Lehman, vice president of those companies in which he heretofore has been secretary. D. V. SHERLOCK has been elected president of the Union Steel Casting Co.; L. D. SMITH, president, and JOHN MILLE, a director and vice president of Lewis Foundry & Machine Co.; ROBERT F. MCCLOSKEY, president of Blaw-Knox Construction Co. and Hoboken Land Co., vice president of Blaw-Knox International Corp., National Alloy Steel Co. and A. W. French & Co., and a director of Union Steel Casting and Pittsburgh Rolls Corp.; H. B. LOXTERMANN, vice president of Blaw-Knox Construction Co., Blaw-Knox International and Hoboken Land.

Mr. Smith also has been elected president, and F. A. BEATTY, vice president of the Groveton Land Co. W. W. HOLSINGER has been elected secretary of Lewis Foundry & Machine Co. and ALBERT CUFF has been made a director and secretary of the Blaw-Knox Construction Co., Blaw-Knox International, Hoboken Land Co., National Alloy Steel, Union Steel Casting Co., Pittsburgh Rolls Corp., Groveton Land, and A. W. French & Co.

♦ ♦ ♦

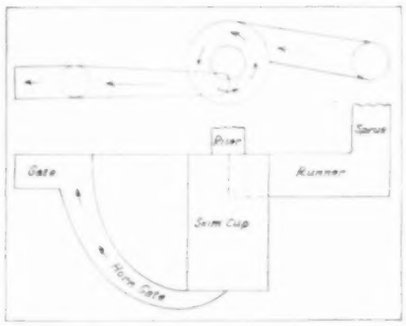
LEWIS ACKER DIBBLE, president and director of the Eastern Malleable Iron Co. and the Risdon Mfg. Co., Naugatuck, Conn., has been elected president of the Malleable Founders' society. Mr. Dibble was born in 1885 in New Haven, Conn., and graduated from Yale university in 1907.

His business career began with the C. Cowles & Co., New Haven, and in 1909 he joined the Oakville Co., Waterbury, Conn. In addition to his other positions, Mr. Dibble is a director of the Bridgeport Brass Co., Bridgeport, Conn.

Gate Insures the Delivery of Clean Metal

By George Marlow

A type of skimmer gate which delivers clean iron to the mold is shown in the accompanying illustration. I consider this is the best type of skimmer gate in use and wonder at times why it has not been adopted more extensively. The metal from the sprue enters the cup at the top through a tangential runner which imparts a whirling motion. Clean metal leaves the bottom of the cup and rises through a horn gate to a point on the joint of the mold where it flows through the gate proper into the mold. Once the cup is filled with metal it is apparent that it will remain filled irrespective of whether the sprue is kept filled or not. Also any foreign material entering the cup is kept in motion and will float to the top. This type of gate is employed regularly on all castings from 100 to 2000 pounds. I do not claim that this gate is a new development, but in my 35 years experience in the foundry I have seen it used in only three shops.



Top and side views of gate combining a skim cup and horn passage

Engineers Plan Session on Metals

An entire day, Thursday, Dec. 3, during the annual meeting of the American Society of Mechanical Engineers at New York City, has been set aside for a symposium on corrosion resistant metals in design of machinery and equipment. Included in the three sessions will be discussion of typical compositions, mechanical properties, available commercial forms, corrosive conditions for which the material is recommended and not recommended, recommended methods of fabrication, design, forming, joining, machining, etc., and typical examples of application in construction. Information is to be presented in compact, practical form so that papers may be assembled later to form a handy reference. T. H. Wickenden, past chairman of the society's iron and steel division is chairman of the committee in charge of arrangements.

Papers to be presented are: "Introduction to Corrosion Resisting Metals," Dr. F. N. Speller, National Tube Co., Pittsburgh; "Alloys of Aluminum," E. H. Dix Jr., Aluminum Co. of America, New Kensington, Pa.; "Nickel and Nickel-base Alloys," F. L. LaQue, International Nickel Co., New York; "Zinc in the Cnemical Industries," E. A. Anderson, New Jersey Zinc Co., Palmerton, Pa.; "Lead," G. O. Hiers, National Lead Co., Brooklyn, N. Y.; "Cast Iron in Chemical Equipment," Dr. H. L. Maxwell, E. I. du Pont de Nemours Co., Wilmington, Del.; "Copper and Copper-base Alloys," R. A. Wilkins, Revere Copper and Brass, Rome, N. Y.; "Corrosion Resistant Steel (Stainless Type)," J. H. Critchett, Union Carbide and Carbon Research Laboratories, New York.

One Signature Spans 50 Years of Advertising

Fifty years ago L. S. Brown, president of the Springfield Facing Co., Springfield, Mass., mailed a photograph of his three children to friends and customers. A letter, drawing an appropriate analogy between the company's products and the illustration, was enclosed. This was signed by Mr. Brown, as president. Today he holds the same position and is still signing advertisements, an unusual situation.

In a recent note to THE FOUNDRY, Mr. Brown stated that in 1886 even advertising was carried out in a different manner. People were inclined to be more sentimental. Competition of today was as foreign to the business world of that period as was the automobile. His advertisement, emphasizing the appeal of children, caught the popular fancy and consequently brought in numerous replies.

ADVERTISING PAGES REMOVED

More About—

Why More Captive Foundries?

IN JULY, THE FOUNDRY offered questions based upon the tendency of casting users to build their own foundries. Foremost in the thoughts of jobbing foundrymen and considered seriously by those that buy castings, these questions brought forth an interesting discussion which found space in the August issue and is concluded in the pages following.

Many new ideas have been put forward. A broader viewpoint is reflected on the part of jobbing foundry operators. A better appreciation of quality and service is shown.

This is not a debate. It cannot be settled by agreement of judges, even if men existed with sufficient knowledge and foresight to make a decision upon the testimony offered. But the facts presented are worthy of consideration where captive foundries are projected upon unsound economic foundation.

The discussions which follow, for evident reasons, are unsigned.

How Many Captives Are Abandoned

I WAS away practically all of the month of July on business. Hence have had no opportunity to study the editorial in THE FOUNDRY for July. I think that you have touched on an important part of the foundry game and my reaction is distinctly favorable to the editorial.

I do not know whether it could be done, but if it were possible to publish a list of foundries that have been discontinued by the large manufacturing companies, due to the substitution of fabricated parts for castings, as well as the depression, I think it would make other manufacturers who contemplate starting a foundry in connection with their plant, stop to consider such an investment seriously, when the big manufacturing companies are abandoning their foundries. With the foundry capacity that we have of all kinds, the prices at which the castings can be purchased, and the deliveries made, it is the height of folly for any more to be brought into existence.

Some of the manufacturing companies may want to take their increased earnings and invest them in plants instead of distributing them as you are compelled to do by law, but it would seem to me to be a dog in the manger policy, and one which would eventually return to plague them.

Keep up the good work and foundrymen will still be able to make a living.

Believes Costs And Co-operation Needed

THE question of why so many casting users spend their money to go into the foundry business is in the opinion of the writer, one which has only one answer, that is, they think possibly there is a profit in the foundry business which they can get for themselves by having their own foundry. This may be true or may not be true, depending on whether they lose more money in bad times than they make in good times. Our inclination would be to believe that it is a pretty even break.

If they would only look up the record of profits shown by foundries in the last 20 years, we doubt if any of them would put any investment in their own plant, as they cannot expect to run more efficiently than a foundry doing nothing but foundry work.

We have always gone on a theory that we know more about the foundry business than anything else and we are quite sure that we do not know too much about it and just because a company has been successful in making stoves at a profit does not necessarily follow that by building a foundry he will also make a profit on castings.

The question raised as to only inferior beings going into the jobbing foundry business is interesting and the writer is of the opinion that the profits made in the foundry business over a period of time certainly would not attract intelligent men, except in specific instances.

Regarding the profit item, the writer recalls talking with one foundryman about how the profits were and he made the remark that they were all right. Well, I said. "How much did you pay in dividends last year and how much profit did you make."

He said, "Oh! I didn't pay any dividends and didn't recall what the profits were."

I asked him how much he thought was a fair salary to draw, depending on the volume he was now doing, as president of the company and he said, he didn't figure it that way. So I asked him how he arrived at the amount of salary he should have and he said that he didn't draw any salary through the year but if there was money left over at the end of the year he took it.

So you see, we have quite a variety of competition. We like to feel that jobbing foundries do have a place in the industrial and manufacturing structure of American business, but unless manufacturers allow a better margin of profit they will find themselves forced to either pay a very high price for castings or go into the business themselves.

The holding of prices of a foundry source which is not responsible, against one that is responsible and thereby keeping the price of castings below the profit margin is one of the unreasonable things which still occur. How this can be corrected is difficult to guess and the writer is inclined to think that the Golden Rule is the only thing that would help the situation—if some buyers of castings would read it occasionally.

We have been in the foundry game for 26 years and have seen a great many of them come and go and have seen many foundries close for lack of production. We believe that the greatest handicap on the foundries today is their lack of co-operation and lack of cost knowledge.

Have Not Studied Primary Customer Needs

I WAS extremely interested in the editorial "Why More Captive Foundries?" and I wish to congratulate you on the way in which you presented a difficult problem.

I feel that "captive foundries" exist principally because of the lack of understanding between the foundrymen and their customers. The foundrymen have not interested themselves sufficiently in the needs of their customers with resultant non-uniformity in both quality and service. We have not done a good engineering and selling job.

Buyers of castings, on the other hand, have in general not given the

(*Continued on page 50*)

All the way from billets, to product . . . CARBORUNDUM

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● *Snagging steel gear blank casting with Aloxite Brand Aluminum Oxide Wheel, 14 grit, 12 grade, on high speed swing frame grinder.*

● *The semi-finish grind on a roll for finishing strip steel. The wheel, Aloxite Brand Aluminum Oxide in 120 grit, P grade.*

THE CARBORUNDUM COMPANY

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ON the line in the billet grinding departments, in the steel and iron foundries, in the polishing rooms of the great metal producing plants of the world—there you will find these products of The Carborundum Company serving the metal industry:

- Aloxite Brand Aluminum Oxide Wheels and Polishing Grains.
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They are all definite factors in the modern trend of the industry toward increased production, improved quality, better finishes and more accurate surfaces, lowered grinding and finishing costs. There will be a complete display of these products at the National Metal Congress and Exposition at Cleveland.

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Sales Offices and Warehouses in New York, Chicago, Boston, Philadelphia, Cleveland, Detroit, Cincinnati, Pittsburgh, Grand Rapids. (Carborundum and Aloxite are registered trade-marks of The Carborundum Company.)

● *An Aloxite Brand Aluminum Oxide Wheel in 60 grit, J grade, grinding steel casting for ring gear. The operation is spot grinding for Brinnell test.*

● *Grinding small steel castings or parts. The wheel, Aloxite Brand Aluminum Oxide in 16 grit, 12 grade.*

THE CARBORUNDUM COMPANY

(*Continued from page* 47)

foundry much of a chance through exerting price pressure, switching sources and generally not consulting with the foundry on design.

The logical result being that a number have gone into the foundry business. It generally seems to be a fact that after this step has been taken, one finds a great deal more respect for and appreciation of the foundryman than previously.

If only a *closed season* could be arranged for foundries so that we could catch our breath and educate ourselves to study our customers' problems, instead of filling up our days and nights with worries about how we are going to make our cost come down to our prices, I believe that the casting user would be agreeably surprised at the results. By a *closed season* I mean that each casting user might have a period to consider his present foundry source as a department in his own plant, and for the sake of this discussion—a sick department.

Under such circumstances he would logically encourage the sort of interchange of ideas which must come before the foundry can do a real job for him.

Spotted Demand Raises Captives' Unit Costs

WHY More Captive Foundries?" The answer will always be that there are general managers who think they can run foundries on limited tonnages more efficiently than people in the jobbing foundry line. This will always be the answer in spite of the fact that it costs them more to operate these foundries due to intermittent demands for tonnage for their product, usually in the durable goods industries field. They always forget the peaks and valleys in the production curves and the money it costs to carry a foundry.

Only this last week one large company has come to us asking us to buy them out. The answer of all the experts as to the cause of their troubles was they had tried to departmentalize their business too far. Among the departments which they operated was a forge shop, a spring shop, and a steel foundry. It might have been convenient to own all of these when they had difficulty in securing delivery, but they have found these specialized departments have bankrupted them due to carrying charges during the depression; whereas, if they had been content to secure their material from recognized sources they would have been in the position of their successful competitors who have taken advantage of the sources of supplies and used their capital in selling effort rather than investing it in plants.

This is almost a universal story for the captive foundry owners in the steel casting field. I can name a number of companies having steel foundries who have found them unprofitable. The fault of the whole situation lies at the foundry industry's front door, because of the lack of intelligent selling effort on the part of the foundry associations. On the other hand, we know that the Steel Founders Society of America has prevented scores of companies from starting their own foundries or foundry departments in their own business in the last few years. I think the editorial is a good one.

Shopping Around Chokes Improved Service

FROM such information as I have received, castings have cost more when large casting buyers built their own foundries than they did when they were purchased from jobbing foundries. The companies usually did not expect this increase from preliminary data they had before building, but after they had the disappointment they excused themselves by thinking that the higher cost was justified by better service, etc.

The writer does not doubt that in many cases there is better service because when the work was scattered in jobbing shops the purchasing policy generally keeps the jobs moving around on price competition basis so that no one jobbing foundry can depend upon the business as a steady business. Therefore, the jobbing foundry cannot afford to give the work preference or spend money for equipment that he would like to have to produce the castings in the most satisfactory way.

We think that in general, the jobbing foundries are manned with capable men, and I think that if the larger buyers of castings would realize that buying castings is something different than buying a pound of sugar or a hundred machine bolts and would attempt to think of the jobbing foundry with which they deal as a manufacturing division of their own business and then start co-operating with the job foundryman as he must when the company has its own foundry, then the large buyers would find job foundries a distinct asset. Costs would be lower, casting quality higher, and general satisfaction greater. This presents one of the critical problems of the jobbing foundry. We are victims of a buying psychology that thinks of us as sheep ready for a killing or pirates unfit for business existence. It is my hope that in some way the executives of the future will disclose a broader view of things and accept the job foundryman as a business friend deserving the same loyalty credited other fundamental divisions of his own business.

If this changed buying psychology eventually occurs then in my opinion the tendency you point out in your editorial will reverse itself.

Machine Builders Might Have Saved Capital

I WANT to congratulate you on the two fine articles in the July issue of THE FOUNDRY.

I am confident that many of the machinery builders who have installed steel foundries would have saved money if they had continued to purchase castings in the open market.

Regarding your article, "What Is It?"

—It certainly is to the point. It is unfortunate that the representatives we have in our Congress and Senate have little appreciation of the merchandising problems of the manufacturer.

Recounts Early Impetus in Steel Branch

THE question raised in your article "Captive Foundries" takes my memory back over a considerable stretch, as I recall some of the reasons why certain industries established their own steel foundries.

To begin with there are two companies here in our city who established their own steel foundries the same year this company was formed. Both companies bought small converters. Both companies experienced considerable difficulty in getting deliveries of steel castings in 1906. During that year the demand exceeded the steel foundry capacity of the country. Deliveries were poor and prices were high. A company in a neighboring city was influenced in about the same way. Their requirements were heavy and after the war there was a steel foundry available which they purchased.

Another company took over one of their competitors and along with it a small steel foundry. These instances are all that I recall in this district, but it is a significant thing that with the exception of one company, the establishment or purchase of a steel foundry by these various industries has not solved their problem.

The company in the nearby city purchases more castings than it makes and at as low if not a lower price than their own cost. One company here is a seller of castings for some lines and purchases steel castings in other lines, several other lines in fact. Most of these foundries are inadequate under normal conditions,

(*Concluded on page* 52)

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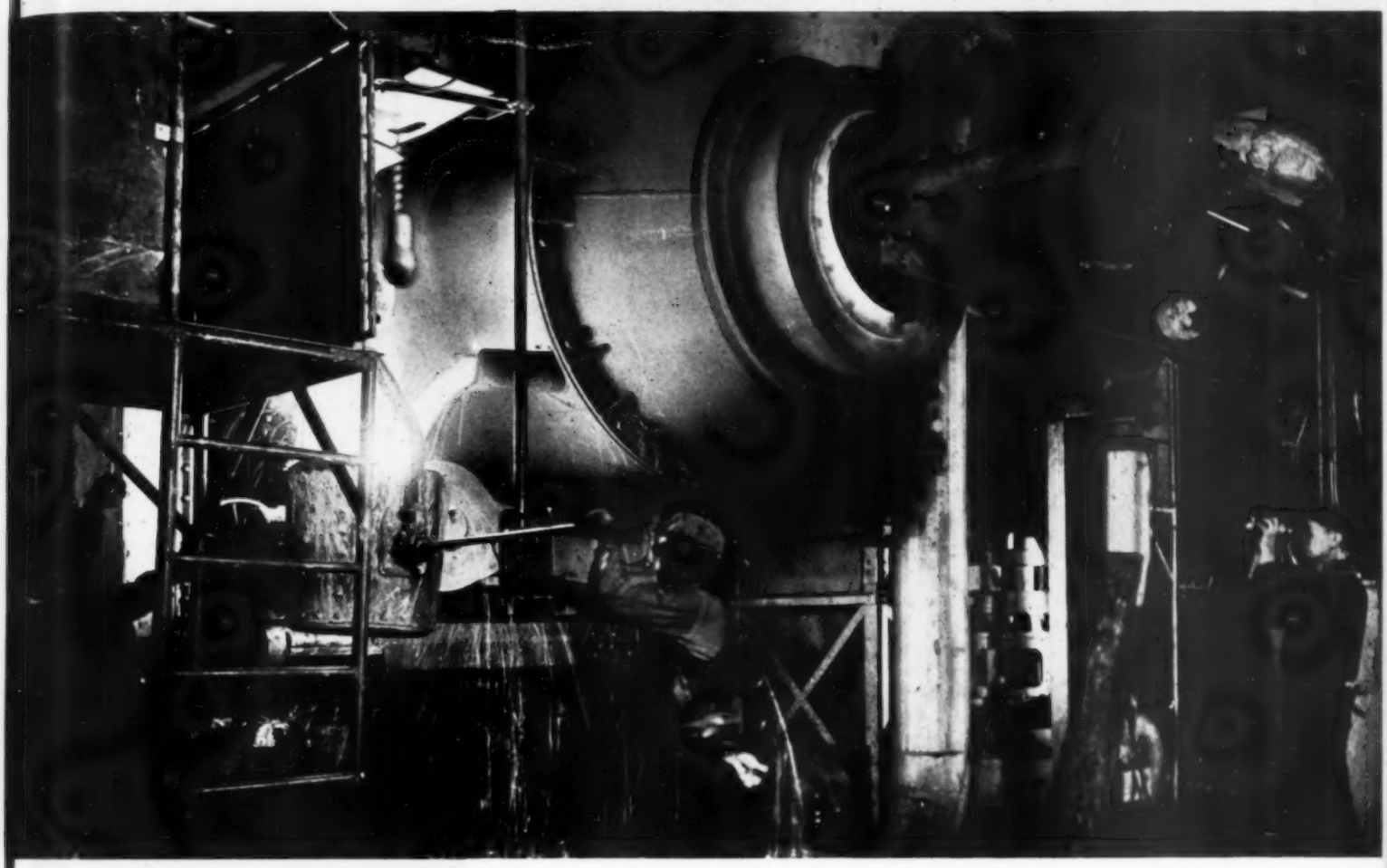

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PIONEERS SINCE 1884

(*Concluded from page 50*)

and there is only one of them, that I recall, that really makes all of its steel castings and does not solicit custom business.

Another factor. With the development of the electric steel furnace the sellers of this equipment have been very enterprising. The establishment of a number of probably unnecessary foundries has, no doubt, been due to the fluent arguments of these manufacturers of electric furnace equipment. It is, of course, a perfectly legitimate field for commercial activity and there is not much that any one can do about it, except through a campaign of educating the possible buyer to all the factors of cost.

First of all there is hardly a section of the country that is not now being adequately served by existing steel foundries. Second, many buyers feel that steel foundries can be added to their plant equipment and operated with little additional cost. This is especially true of concerns that are already operating iron foundries. They lose sight of the fact that there is only one point of similarity between an iron foundry and a steel foundry. They both melt ferrous metal and pour it into molds, but in every other respect, raw materials, melting methods, melting practice, molding, gating, cleaning and finally annealing, are entirely different.

The writer has observed on many occasions that castings are accepted from steel foundries and used in machine shops of the parent company which would not be accepted from an outside foundry. I have not observed this recently because I have not been through such plants, but I have noticed it many times in the past.

The establishment of unnecessary steel foundries is some times due to over enterprising chambers of commerce seeking new industries for their localities, but my unsolicited advice in all such cases is that they make a careful survey and put themselves in possession of accurate information before making any commitments.

Economic Factor Second to Human Nature

YOU have a whole lot of psychology and human nature wrapped up in captive foundries versus jobbing foundries. Every owner of a factory using a sizable tonnage of castings is an individual who likes to be self-contained and believes he knows his own problem just a little better and wants to control his source of supply. On the other side the ancient and honorable foundryman whose only business was castings, thought he was doing the other fellow a favor by making his castings, that all the secrets of the universe were tied up in his outfit, and was a good deal like the railroads once were, when it took a $5.00 bill to get an empty, both failing to recognize they had a service to sell also.

There is no doubt that the jobbing foundryman forced captive foundries upon himself by a number of causes, which we can easily mention, and was too bull-headed to remedy them. Recalling my earlier experiences, I could draw a composite picture of this "Bull of the Woods."

My feeling today is that the mental capacity of the jobbing foundryman has enlarged a whole lot. He has added, and I think he enjoys it, the idea that he wants to be considered a part or department of the shop of everyone of his customers. He's using his head, offering suggestions concerning design and better costs. His reward for this is fewer captive foundries starting up.

I'm not so sure in malleable, the economics of a captive foundry against a jobbing foundry have ever been a deciding factor. That was supposed to take care of itself.

Believes Captives Lead Technical Progress

YOU asked several questions on your July editorial, which, under the immunity granted by your promise therein of confidence, I cannot resist commenting.

We do not have to go back many years to witness a period when cast iron was rapidly losing ground to other materials and was openly characterized as unreliable. At that time, as now, cast iron was a less expensive alloy pound for pound or casting for casting. Iron founders, jobbing and captive, lost tonnage not because they were not skilled in rapid and economical production, not because they did not possess mechanical facilities or skilled personnel. They simply did not produce material of quality demanded by the trade. The captive foundries had direct pressure brought upon them, because their consumers and their bosses wanted to hold to the low priced material.

You will grant that there has been a great advance in quality and uniformity of cast irons, and in the production of new varieties. Who made that advance? With a few exceptions advances were made by the personnel of the captive foundries and by some suppliers of raw materials. By and large the jobbing shops were content to continue their old ways, or to put it mildly, not to support technical advance.

Captive foundries were started years ago for one of two main reasons — lower cost castings, or castings of quality better suited to the particular requirements of their consumers. In many cases the cost theory was unsound. The recent revival period demonstrates clearly that the captive foundry could and did "tailor" the product more closely to the requirements, and did a lot of real development for the general good of the industry beside. Why should they not continue to exist?

This is written with due apologies to the scattered few jobbing foundries who sensed the trend of the times and produced the quality required. Such foundries are in no danger of losing their place in the industrial and manufacturing structure of American business.

Book Review

Symposium on Welding of Iron and Steel; cloth, two volumes of 696 and 984 pages, respectively, 5½ x 8¼ inches; published by the Iron and Steel institute, London and supplied by THE FOUNDRY, Cleveland, for $11.00 postpaid and in Europe by the Penton Publishing Co. Ltd., London.

These two volumes constitute the proceedings of a symposium on welding of iron and steel organized by the Iron and Steel institute in co-operation with a number of other technical societies and conducted on May 2-3, 1935, during the institute's annual meeting in London. The printed volumes embrace about 150 technical papers specially written for the symposium and contributed by 15 technical societies, including several foreign societies. The papers are divided into five main groups, each of which is prefaced by a summary and is followed by the verbal and written discussions. Group 1 is incorporated in Vol. I and groups 2, 3 and 4 in Vol. II.

Group 1 deals with present-day practice and problems of welding in engineering industries and is in turn broken down into two subgroups. Group 2 deals with welding practice and technique, including welding apparatus. Group 3 treats with the metallurgy of welding. Group 4 concerns specifications, inspection, testing, and safety aspects of welding.

A foundry producing heavy duty, high pressure pumps and using chilled cast iron for plungers, liners, casings and other parts subject to heavy wear and abrasion, changed to an alloy iron containing about 4.50 per cent nickel and 1.50 per cent chromium which cast in sand gave brinell hardness up to 650. That procedure is claimed to result in fewer rejects, elimination of costly chill equipment, and improved product.

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Height of efficiency or something

The Adventures of BILL

By PAT DWYER

"PURRY soft," Bill commented as he calmly appropriated the visitor's chair and cleared a space on my desk for his heels. "Purry soft I calls it."

"If you mean coming in here, occupying about twice as much space as necessary and interrupting a very busy man, I am inclined to agree with you. You may have all afternoon to fritter away, but I have work to do. Pretty soft, eh? How would you like to trade jobs for a month or two. If I was a mercenary minded person I should lay you a small wager that before the first week was up you would be creeping around with big salt tears streaming from your eyes, begging me to cancel the arrangement."

"Trade jobs for a month or two, hey? Well, I'll tell you, the answer is yes and no. I might take it on for a vacation job, just by way of recreation, but I do not fancy sitting here month after month like an atrophied figure of Buddha."

"The usual error," I pointed out tolerantly. "Because I am not juggling two telephones, jumping violently up and down, and dictating rapidly to two stenographers you hastily jump to the conclusion that I am not earning the crust and the pinch of salt. Strange as it may seem to you this job is based on mental effort. You have had no personal experience on which to base an opinion, but it is barely conceivable that you may have heard or read, that intense mental effort rarely is associated with violent physical activity."

"Intense mental effort!" Plainly Bill considered this a rather lofty flight into the realms of fancy. "Funny how easily some people kid themselves. Fellows with distorted sense of humor write you goofy letters or send you newspaper clippings. You paste 'em—the letters and clippings, not the birds who sent 'em—you paste these offerings on a sheet of paper, stick a few words here and there and your work for the day is done. If that is intense mental effort, what about the effort of the bimbos who cut out paper dolls?"

"Personally," I said, "since I am a gent of quiet and refined taste I should prefer to drop the controversy at this point with a more or less complete quotation of a certain proverb dealing with pearls and swine, but what's the use? With your well known perversity you probably either would ignore it altogether or miss the point. However—"

"I know the one you mean," Bill interrupted. "Two pigs under a gate or something. One of 'em was a squealer probably laboring under intense mental effort. Well, I'm glad I dropped in. Lend me a match, and I'll be on the way."

"Good bye. You will find that the door opens quite easily. Please do not bang it as you go out. If you were not in such a hurry I might show you some documentary evidence to prove that a galley slave chained to the oar led a life of ease and leisure compared to me in my effort—as you surmise in your abysmal ignorance—to paste one of these contributed newspaper clippings on a sheet of paper."

Life is just one clip after another

Bill slumped further down in the chair. He selected and lighted one of my stogies, re-crossed his feet on the desk and gestured lazily with the nigh, or free hand.

"You have our gracious permission," he said. "The day is young and I have nothing else to do. Proceed with due care and discretion. Watch the traffic lights. Cut out the baloney and stuff and things. In a word, cut it short. The core, no more. Do I make myself clear?"

"I won't hold you more than the length of one smoke. Here is a newspaper clipping sent me by a lad in New York. It is headed "New Foundry Wing Stirs Neighbor's Ire."

"Your Honor, I object to the word *ire*. Why do these headline writers insist on using a word that has been out of circulation since the days when Hector was a pup?"

"Objection sustained. The court confesses to a slight feeling of nausea each time the word is encountered. Fortunately the only people who use the word are headline writers and cross word puzzle addicts. Charitably we may assume they are in the same category as purchasing agents, whose personal characteristics, inability to reproduce and final destination are outlined so neatly by the late Fra Hubbard."

"Any relation to Old Mother Hubbard?"

"Certainly. One of the Hubbard boys from down Goose Creek way. Anything further? No? Well then listen:

A group of nearly 100 Brooklyn property owners staged a demonstration in the tenth floor corridors of the Municipal building early yesterday afternoon after the board of standards and appeals, following a hearing, granted an application for construction of an addition to an iron foundry in the Brownsville section.

So heated did the protest become that the police were called. An emergency truck and several radio cars arrived, whereupon the commotion was quickly stopped and the property owners left the building. There were no arrests.

"That was nice of the property owners," Bill commented. "I mean, leaving the building. They might have taken it with them."

"Silence in the court. Pay attention:

The delegation remained quiet in the hearing room while argument on the granting of the permit was in progress, but when the board approved the foundry addition, the demonstration began. After the property owners had been escorted to the street they continued shouting for a few minutes and then dispersed.

"That's all in the first paragraph," Bill waved a hand in dismissal. "What's the idea in going over it again? I heard you the first time."

"Quiet. I did not write the thing. I merely am quoting the published version. Newspaper writers always repeat, probably in deference to the assumed mentality of their readers. Le's see where was I?

The property owners who protested said they owned more than $1,000,000 worth of property in the neighborhood where the iron foundry is located. They contended that the addition would harm their property.

In granting the permit for the addition, the board stipulated that no riveting or fabrication of metal was to be done in the construction and that a brick wall with solid gates be built around the addition so that neighbors would not be disturbed.

"Well," said Bill, "offhand I should say that means a long good bye to any addition. 'No riveting or fabrication of metal,' hey? Down in our part of the country fabricate means to build. If the owners are not allowed to build the building, how are they going to put it up?"

"Possibly they may build it in one of the subterranean caves, tunnels, tubes and subways which underlie the city. Racket of riveting hammers never would be noted in one of these places. After the building is finishd they can lift it out with a crane and set it down on cushioned pads on the lot."

"A truly ingenious idea," Bill admitted. " 'Twould have to be done at night, though while Brooklyn sleeps and while the watchman with staff and lantern parades the streets assuring the natives that it is 2 of the clock, a rainy night and all is weh-ell.

"However, that solves only half the problem. How about this here now brick wall with solid gates to be built all around the addition? Does that mean that the brick wall is made up of a continuation of solid gates, or, that an ordinary brick wall surrounding the building is provided with two or more solid gates? With the exception of a few antiquated shops in which the doors have fallen from the hinges, practically all foundries are provided with swinging doors or gates through which men and materials enter and leave the building. I confess I am rather at a loss to figure out how the boys are going to check in and out through a solid gate. Is there anything further in the published story that would throw a glint or two of light on this item?"

"Reading the story rather hurriedly," I said, "that feature escaped my notice. Basing an opinion on general observation and one thing and another I shall not be surprised to learn that the company has managed to wangle a federal loan for the purpose of building a bridge over the wall, or a tunnel underneath. I wish you would not persist in interrupting. I have one more paragraph to read:

The owner of the iron works, and his attorney, took refuge in an office on the floor until the demonstrators had been escorted to the street.

"I like that word 'escorted,' " Bill grinned in ironic approval. "Shows that the lad who wrote the story has a fine and discriminating taste in his choice of language. Is that the end of the story?"

"Certainly not. The citizen who sent me the clipping added a note to the effect that he thought I would be greatly interested in this account of a demonstration staged against the building of an addition to an iron foundry in the greater New York district.

"As I said in the beginning you have no conception of the volume of work entailed in pinning down one of these vagrant newspaper stories. Years of experience have taught me to view each one with the deepest suspicion. If it was not for the fact that I winnow a few grains of wheat occasionally from the chaff, I should be tempted to throw each and every one in the waste paper basket. A stern sense of duty in this instance prompted me to write my correspondent:

Dear Ed: Thanks for thinking of me during this recent spell of intolerable heat. I am just wondering if the heat also is responsible for the story of the popular demonstration against the 'foundry.'

You know, the average newspaper reporter thinks that every plant in which iron, steel or any other metal is fabricated, is a foundry and invariably the workmen are 'puddlers!'

I have checked through that infallible guide *Penton's Foundry List* and I can find no foundry, iron, brass, steel or malleable listed at the address given in the newspaper item.

In the interest of truth and justice, I think it would be a swell idea on your part to send one of your undercover men down to that district and get the real low down. Basing an opinion on one thing and another including the names of the owner and his attorney. I shall not be surprised to learn that the place is a junk yard instead of a foundry. Needless to say I shall neither eat nor sleep—with maybe a few minor exceptions—until the postman knocks with your reply.

"A few days later I had his reply:

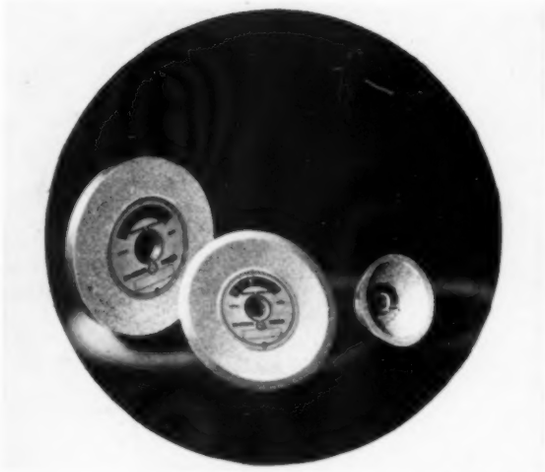
Sorry. It is just as you suspected. The firm is in the business of fabricating steel and ornamental iron. It has no foundry. However, maybe you can dope some kind of a story out of the whole thing. Something like the one where the reporter came back to the city editor and reported there was no story on the wedding because there was no wedding. The groom failed to show up, the bride had hysterics and the party broke up in a fight."

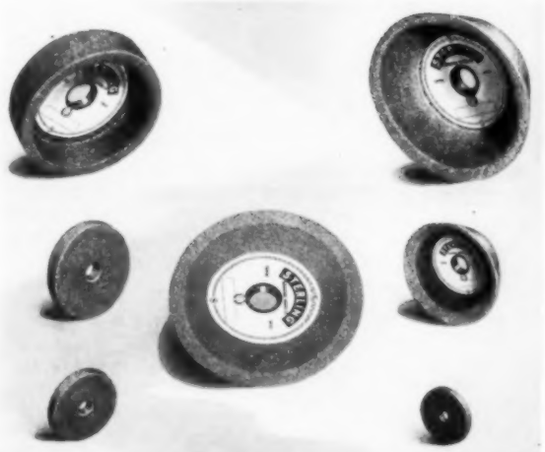
"I'll look in again," said Bill. "When I cannot stay so long. GOODbye!"

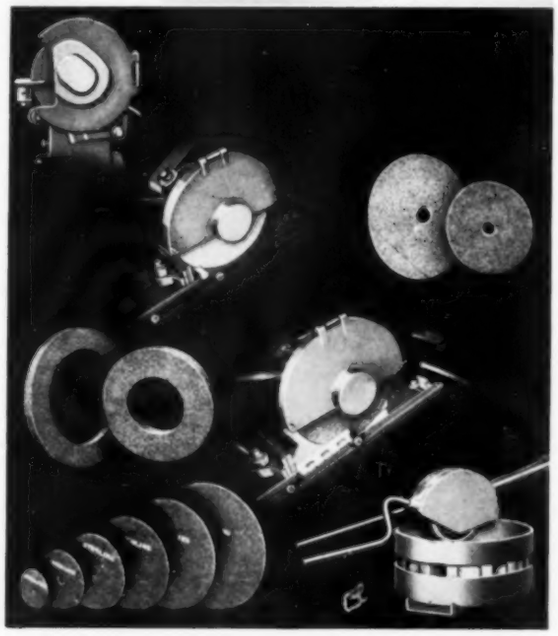
Chicago Office Moved

Climax Molybdenum Co. of Michigan has moved its Chicago office to 230 North Michigan avenue.

Jilting seems to have improved her stance, drive and follow through







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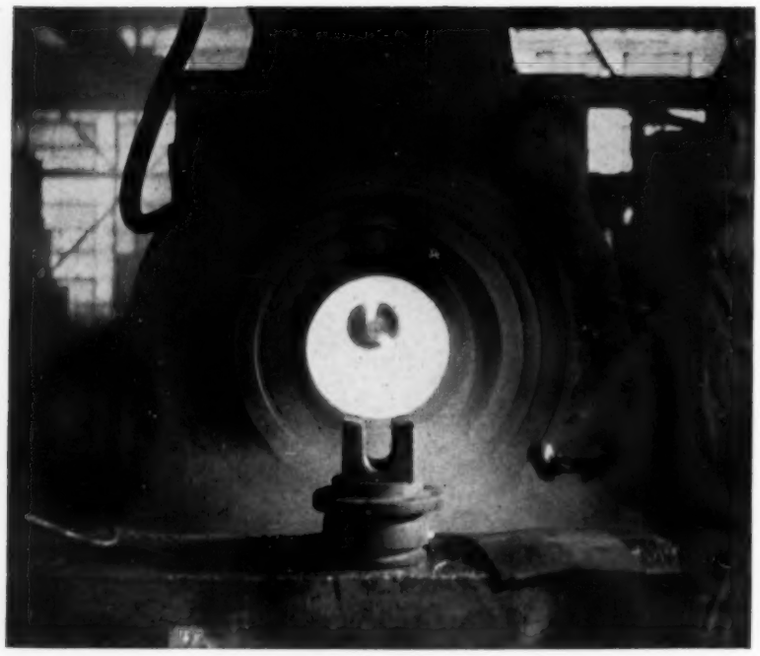

Fig. 1—Looking into the bell end of the casting machine during the pouring process

AN INTERESTING description of the method employed in the casting of casting corrosion resistant alloy iron pipes is presented in a recent issue of the *U. S. Piper*, a publication issued by the United States Pipe & Foundry Co., Burlington, N. J. That company recently has produced a new line of pipe made of Ni-resist, by the super deLavaud process. The deLavaud casting machine consists essentially of a water cooled steel mold which can be rotated at comparatively high speed by an electric motor, and a trough supported at one end only with a pouring spout curved toward the wall of the mold and extending through the mold, by means of which the molten metal is fed. The rotating mold with its driving motor is mounted on a slide and has a longitudinal travel equal to the length of the pipe. A hydraulic cylinder moves the mold along the bed so that a constant traveling speed is maintained.

In the casting operation molten metal is poured into a ladle having a special shape designed to give a constant flow when the ladle is tipped to empty the trough by an electric actuating mechanism.

On bell and spigot pipe a sand core is inserted in one end of the mold to form the bell. After the sand core is placed the motor is started and the mold brought up to casting speed. The ladle is then tipped, allowing the metal to flow through the trough and start filling the far away or bell end of the pipe. The metal fills the bell in a few seconds. When this is done the core setter stationed at the lower end of the machine gives the operator a signal to start moving the mold longitudinally down the bed of the machine. The stream of iron discharged from the spout flows tangentially on to the surface of the mold, where it is held in place by centrifugal force, thus forming a homogeneous pipe.

After the spigot end of the mold has passed the pouring spout, any excess metal is directed into a pig mold. The mold is kept rotating at its original speed until the casting has cooled to a temperature of approximately 1500 degrees Fahr. The casting then is extracted by anchoring it to a puller block and withdrawing the mold. The entire operation requires from 2 to 10 minutes depending on the diameter and length of the pipe. Pipes cast by this method ordinarily have the typical structure of cast iron when cast against a chill, a well defined chill area where the molten iron comes in contact with the water cooled mold. This area subsequently is eliminated by annealing.

After much experimentation it was discovered recently that a chill-free pipe could be cast by the deLavaud process if a film of pulverunt material, which does not react chemically with the iron, could be deposited evenly on the mold just prior to the contact of the molten iron. Initial difficulty was experienced in making the film so that the mold would be coated evenly and yet accomplish the desired result without introducing metallurgical changes which might be objectionable. The problem finally was solved by depositing the coating by a stream of carrier gas through a nozzle located on the pouring trough a few inches back of the

(*Concluded on page* 61)

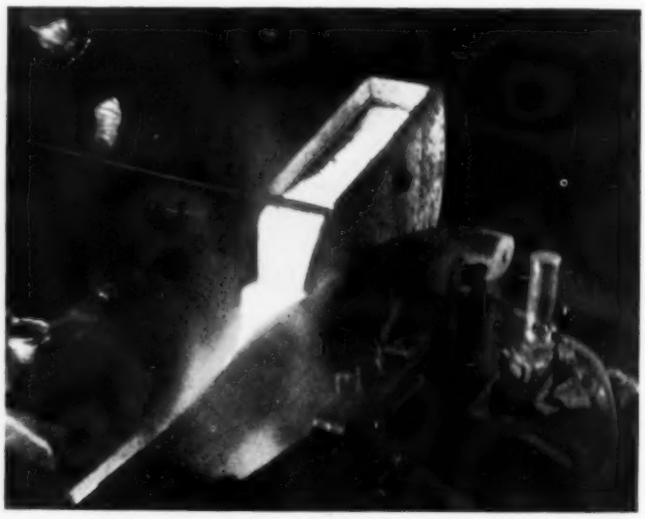

Fig. 2—Molten metal flowing from the special ladle into the pouring trough which conducts it into the pipe mold

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(*Concluded from page* 58)

pouring spout. The amount of pulverunt material required is small and varies with the diameter and thickness of the pipe. Only 200 grams are required to eliminate the chill on a 12-inch diameter pipe 18 feet in length.

Unalloyed pipe made according to this method is reported as 100 per cent more resistant to impact shock than the chilled pipe. Ni-resist pipe cast by this process is free from chill and shows a homogeneous structure throughout the section.

The Burlington, N. J. plant of the United States Pipe & Foundry Co., has four large cupolas, each capable of melting approximately 22 tons of metal per hour for the casting machines. In addition to the cupolas, two Ajax Northrup coreless induction furnaces of 1000 and 500 pounds capacity are available for melting the special pig used in the Ni-resist production. All the cupolas are equipped with 12-ton forehearths which serve as mixing pots where variations in the speed of melting, iron composition and temperature are reduced to a minimum.

Iron Oxide Should Be Held At a Minimum in Carbon Steel

By Frank M. Meyers

IN THE manufacture of plain carbon steel castings, especially in the small electric furnaces, where heats are produced at short intervals, much difficulty is encountered in controlling iron oxide, an element which is most detrimental to a good quality of steel, regardless of other elements. While it is not possible to eliminate all iron oxide from carbon steel, it is important to keep that element at a minimum.

Through years of research and experimenting it has been found that the duration of time for the production of heats is an important factor. To produce good sound finished or killed carbon steel, it is absolutely necessary to allow ample time for complete reactions with proper temperature and slag. In the case where iron ore is used for carbon reduction, still more time is required for a complete reaction. However, use of iron ore in small electric furnaces hardly is good furnace practice because enough time never is allowed for a complete reaction or killing the metal without the use of deoxidizers. Of course, artificial means are used for finishing or killing carbon steel such as ferrosilicon, ferromanganese, aluminum and many others, but if these elements are used to excess they are detrimental rather than beneficial to the physical properties of steel.

It is difficult for the average melter to determine when steel is completely finished or killed as no means as yet has been found to make a rapid iron oxide chemical determination which would prove beneficial to the melter. However, there are some indications which identify partly killed or partly finished steel: When the metal is tapped into the ladle, it has a bluish white cast. This is one indication the metal is not completely killed. It will not necessarily produce castings with blow or pin holes unless the sand is too wet, but it will produce hot shortness, causing the castings to crack. The metal will not stay liquid as long as the completely killed metal under the same circumstances. It will not run castings readily, but will penetrate into the cores and sand, and cause the sand to stick to the casting, resulting in roughness. The castings will be dirty and contain slag, cracks, and excessive shrinkage with consequent high cleaning costs.

When the completely finished steel, or killed steel, is tapped into the ladle, it has a yellowish cast, resembling colder metal. This metal will never produce castings with blow or pin holes, and it will be at all times quite ductile, eliminating the possibilities of cracked castings, when proper risers are used. The completely finished or killed metal will stay liquid a great deal longer. It will run castings more readily than the partly killed metal. It will not penetrate into the core or sand. It will produce a smooth and clean casting, free from slag, cracks or excessive shrinkage, and has less tendency to scab the mold. This metal will produce a casting superior in physical and machining properties, is excellent for hydraulic or high pressure castings, and it has better fatigue resistance.

A simple and efficient method for determining properly finished or killed carbon steel before tapping metal from furnace into ladle follows: Cast a bar ⅝ x ⅝ x 12 inches in a vertical dry sand core, taking the metal out of the furnace with a test spoon. After the bar is cast let it cool in the core until dark, then cool it in water. Bend the bar to a perfect U. If this is accomplished the metal is completely finished or killed and the heat is ready to be tapped into the ladle. If the bar fractures before the U is completed, that is an indication that there is still too much oxide in the metal and requires more refining. This test is only good for steel with carbon, 0.30 per cent and under. Test bars for steel with carbon over 0.30 per cent are made as follows: Cast a bar 1½ inches in diameter by 6 inches long in vertical green sand mold, taking the metal out of the furnace with a test spoon. Cool the bar in water and break. If bar is solid in center with no porosity the heat is finished. If the bar contains a shrink in the center or porosity, it is an indication that the heat is not finished, and requires more refining.

Carefully selected steel scrap charges eliminate the use of iron ore, but it is hardly possible to dispense with it entirely as in a case of a piece of carbon breaking off of the furnace electrodes and dropping into the bath unknown to the melter. This will cause excessive carbon and necessitates oreing the heat. Also that measure will have to be taken when high carbon foundry scrap has been charged by mistake for low carbon. However, regardless of whether iron ore is used or not it is of the utmost importance to check on iron oxide due to the scale and rust on scrap, and to the working condition of the furnace, as there is always more or less oxidation during melting. The heats should be finished or killed by the proper treatment of slag and furnace temperatures. Deoxidizers should only be used as a secondary precaution in minimum quantities.

Malleable Founders Society Elects Officers

The Malleable Founders' society board of directors, meeting in Canton, O., recently, unanimously elected the following officers:

President, L. A. Dibble, president, Eastern Malleable Iron Co., Naugatuck, Conn.; vice president, Arthur F. Jackson, vice president, Michigan Malleable Iron Co., Detroit, Mich.; secretary-treasurer, Robert E. Belt, Cleveland.

The Malleable Founders' society operates through three sections, eastern, central and western. Each section elects a chairman who will be chosen at the next sectional meeting of the respective groups.

Book Review

This Man Landon, by Frederick Palmer, cloth, 245 pages, published by Dodd, Mead & Co., New York, and supplied by THE FOUNDRY, Cleveland, for $1.50 plus 15 cents postage.

The author of this book visited Governor Landon in Topeka, Kans., became greatly enthused with the man and his accomplishments, and the present book followed. The author has sketched the early background of Alf Landon, showing the training which has prepared him for his political career. He then presents a most interesting discussion of Governor Landon's administration, and especially the cash basis law and how it has reduced taxes and balanced the budget in Kansas.

Reader's Comment

EDITOR'S NOTE—*Material Appearing Under this Head Does Not Necessarily Reflect the Opinion of* THE FOUNDRY *or of Its Editors.*

Purchaser Notes Effects on Captive Sales

TO THE EDITORS:

The checked sections of the attached release on page 2 may be some answer to your recent editorial (THE FOUNDRY for July), regarding competition from captive plants.

G. A. RENARD

Executive Secretary-Treasurer
National Association of Purchasing Agents

The check sections in question follow:

"We Have to Do This Because—"

Beware of the fellow who says: "We have to quote this price because," or "We have to withdraw this price because." Chances are he will go into a long explanation of how the now famous Goodyear-Sears Roebuck tire contract was canceled because of the Robinson-Patman Act. Stop him and put him right on that. The Federal Trade Commission began action to cancel that contract years before the Patman legislation was seriously considered. Several months before the Robinson-Patman Act was passed, the contract was found to be an unfair discrimination under the anti-trust laws, and its discontinuance was ordered at that time.

Already declared to be an illegal discrimination under the broad terms of the Clayton Act by a decision of the Federal Trade Commission, it would have been a foolhardy invitation to punishment to continue operating under that agreement after the Robinson-Patman amendment to the Clayton Act gave that same Federal Trade Commission additional authority to investigate and prohibit unjustifiable price discrimination.

The Robinson-Patman Act is not retroactive or retrospective; so, if you had a legal contract on June 19, 1936, it is still legal. There is another and even more potent protection for contracts, the Constitution prohibits the invalidation of contracts that were legal when made, unless public policy requires their invalidation.

Some Will Be Curbed

Cancellation of other contracts may get the headlines, and a check-up will probably find them to contain discriminations that would be illegal under the anti-trust laws. Price discrimination that tends to create a monopoly or where the effect is to substantially lessen competition has been illegal for twenty-five years under the Clayton Act.

Some contracts, especially those with controlled or captive plants which also supply the competitive market, and perhaps others between related organizations, may have been dodging enforcement of the anti-discrimination laws for a long time.

Other long term or continuing contracts may have been made at exceptionally low prices to prevent the consumer entering into manufacture of the product. Such an arrangement would certainly lessen competition by protecting those already engaged in that line of production. The Robinson-Patman law puts such an arrangement on the spot, but it could probably have been reached through enforcement of the Sherman and Clayton Acts.

Training Men

TO THE EDITORS:

I am a foundryman with many years of practical experience on all classes of work and in all branches of the trade. My experience also includes 7 years as a vocational foundry teacher in one of the large industrial institutions. In that position I wrote my own courses of study, made my own sketches, drawings, etc.

There is no doubt that conditions of recent years have operated to cause a dearth of skilled foundry workers. Every indication points to the probability that the situation will become worse, so that foundry owners and executives will face a worse condition.

During my years as a vocational foundry teacher, it seemed very apparent to me that the idea of giving foundry instruction in our institutions, with the thought that some day the students would take their place in the industry, was a hit and miss affair, and would never solve the foundry managers labor problem.

So I am firmly of the opinion that the place to train foundry workers is on the job. At least those receiving the instruction should be engaged actively. Larger foundries should not find insurmountable difficulties in organizing and maintaining their own instruction departments.

Here is my question to you: Do you know of any foundry owners or executives who might be enough interested in this matter, for me to present the subject?

My work would be to organize and administer a course of instruction. It seems to me that in many highly specialized foundries it would not be necessary to broaden the course too much, nor would it be necessary to retain a professional instructor permanently.

On the other hand, in many shops it would probably be desirable to make the course rather broad and comprehensive, with the idea of not only supplying competent workmen, but finding and educating future members of the executive and supervisory staffs.

A FOUNDRYMAN

Worth Repeating

TO THE EDITORS:

Here is a story for you which I believe every foundry operator should frame and stick up in his office. The story is not original, but it will stand repeating ad nauseam.

A FOUNDRYMAN

Once upon a time, an executive of a manufacturing concern died and went to Heaven. Upon being received by Saint Peter, he asked to be shown his old competitors in the manufacturing business. He was told each group of people in the same line of business lived together. Therefore, it was an easy matter to go to the district and see all of these men at one time.

Upon seeing them he was surprised to find that they were very, very thin. In fact, one could almost see through them. Just at that time, dinner was served, and to his astonishment, platters and platters of delicious food were placed before them. But before any one was seated, an angel came along and strapped an iron spoon on each arm. This spoon was strapped around the wrist and bicepts, thus making it impossible to bend the arm. As a result, they could only look at the food, but could not eat it.

Our friend, in his journeys, went to another section where the lawyers lived, and to his surprise, he found them all fat and healthy. While he was there, dinner was served, and an angel strapped the spoons on the arms in the same manner. To his surprise, each lawyer dipped his spoon into the food and fed the next man to him. As a result, all were served and satisfied.

Returning to the group of manufacturers of his own line, he asked one of his friends why they didn't do the same. The friend replied, "What? Me starving and I should feed that man next to me? Well, I guess not."

Co-operation is not a sentiment—it is an economic necessity. Perhaps if you fed those that fed you, *we* would all be fat and healthy.

Oscar W. Hedstrom Pattern Works, 4836 West Division street, Chicago, manufacturer of wood and metal patterns and models is completing its new foundry division for production of quality aluminum castings. The new division will begin operations about Oct. 5.

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MANUFACTURERS OF LION BINDER — VULCAN BLACKING — EASY CLEANER CORE COMPOUND

Installing Dust Control Exhaust Piping

By C. A. Snyder, American Foundry Equipment Co., Mishawaka, Ind.

Exhaust hoods should be constructed according to needs of the particular application. The dust creating process should be enclosed as fully as possible without interfering unduly with operations. Hoods must be designed to take advantage of the force and direction of the dust particles leaving the operation creating the hazard. It must be remembered that air velocities in front of an exhaust hood drop approximately inversely with the square of the distance from the opening. The most efficient dust collector is but half of a dust control installation, and improper hood designs can render the entire installation useless from an efficiency standpoint.

Hoods should be free from sharp edges and reinforced if necessary. Hinged sections are required for quick access for replacements, as in grinding wheel installations.

Piping should be run in a direct line to the dust control system if possible, but should not interfere with cranes, trucks, etc., and should be accessible for inspection and cleaning or repairs. Where abrasive wear is encountered, it eventually is cheaper to install heavy pipe with flanged bolted joints.

Changes in pipe sizes should be made with a gradual taper of 5 inches length to every inch in diameter, preferably keeping the bottom of the pipe straight its entire length. Branch pipes should enter the main near the large end of the taper preferably on the side or on the top of the pipe. The branch should enter at an angle of 30 to 45 degrees with the axis of the main. Except in special cases, the area of the main pipe at any point should equal the sum of the area of all branch pipes behind the point. Pipes should be supported amply and cleanouts with tight covers should be installed at intervals on horizontal runs, and at bends, dead ends, etc., where dust is most likely to settle.

Pipes should be kept free of obstructions, such as screens, etc., and branches should not project into the main. Joints should lap in direction of flow.

Elbows should be well formed, seven sections being preferable. The centerline radius should be twice the pipe diameter where possible, or a throat radius of 1½ diameter. Elbows should be constructed of material two gages heavier than corresponding sizes of straight pipe.

Blast gates, for balancing the system, should be located near the junction with the main line if accessible. Means should be provided for fastening the gate slide in the desired position.

It is recommended that the following gages be used:

4 to 12 inches diameter No. 20 gage.
12 to 32 inches diameter No. 18 gage.
32 inches diameter or over No. 16 gage.

Joints should be riveted and soldered or double lock seam.

Book Review

"*What You May and May Not Do Under the New Price Discrimination Law*," by Nelson B. Gaskell, 63 pages, 8 by 10¾ inches, half cloth, published by the Kiplinger Washington Agency, Washington, and supplied by THE FOUNDRY at $7.50 plus 15 cents postage.

Nelson B. Gaskell, the author of this publication which was prepared for distribution primarily to subscribers of the Kiplinger service, is a Washington lawyer and for 5 years was a member of the federal trade commission. In his analysis of the Robinson-Patman law, Mr. Gaskell warns against complacent disregard of this legislation stating that manufacturers should not be lulled into security by the evident inconsistencies within the law.

The legislation is unique in that it takes recognition of individual competition. It sets up a procedure by which the accused is assumed to be guilty unless facts are presented to prove non-infraction. Once a case is shown against a respondent if he has not prepared his defenses for his justification by a careful reconsideration of his sales policies and detailed cost accounting, he might as well "throw in his hand." It is thought that the law will emphasize quality differences and the use of quality labels. It tends to eliminate all differentials between customers which cannot be justified in terms of costs.

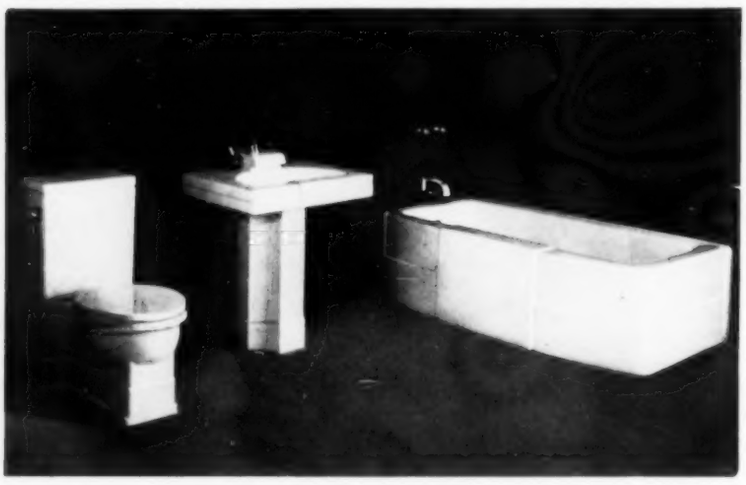
Classification of customers for the purpose of price or discount differences will be impossible. It becomes clear that open price selling is necessary under a law of this character and purpose. Purchasing competitors must be given the same discounts, allowances or advertising service charges when they buy a like quantity of a like quality.

The discussion is simply written, but thorough in its analysis of a law which concerns every manufacturer and seller of commodities.

Eleven English Foundries Are Merged

Eleven foundries in the British light iron castings industry have merged as the Federated Foundries Ltd. with head offices in Glasgow, Scotland. The authorized capital is in excess of $5,000,000, and William Rennie, David King & Sons, Ltd. has been appointed chairman. Among the companies merged are the following: Grangemouth Iron Co., Falkirk; Watson, Gow & Co., Falkirk; Camelon Iron Co., Falkirk; Cameron & Robertson Ltd., Kirkintilloch; David King & Sons, Glasgow; Walter Macfarlane & Co., Glasgow; Jackson, Elphick & Co. Ltd., Birkenshaw, Larkhall; Saunders & Connor-Barrhead Ltd., Barrhead nr. Glasgow; Warrington Light Castings, Warrington; Thomas Allan & Sons, Thornaby-on-Tees, Yorks; Southern Foundries Ltd.

One foundry pouring alloy cast iron at high temperature had trouble with cutting or washing of the sand in the gate. The trouble was eliminated by spraying that portion of the mold face with a thin film of silica wash using a thin plate with a hole in it to protect the remainder of the mold face.



Henry Dreyfuss, famous designer, has developed something new in bathtub design for the Crane Co., Chicago. The new design is called Neuvogue and uses a band and line treatment to give the fixtures a mild modernistic effect. The bathtub is cast

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European Foundry Practice

Digest of recent literature covering various phases of castings manufacture

Gassing

A Study of the Lesser Phenomena Which Accompany Bronze Melting. (De Quelques Petits Phenomenes qui Accompagnent la Fusion du Bronze), by Ch. Dennery, *Bulletin* of l'Association Technique de Fonderie, Paris, France, March 1936.

The author reviews effects of hydrogen, oxygen, carbon monoxide, carbon dioxide on bronze, and also of carbon, sulphur and hydrogen considered as reducing agents. Certain gases are more soluble in liquid than in solid metal, and in those cases cause blowholes when the metal solidifies. Oxidation takes place in the form of a chemical action, particularly during the melting period. Oxidized products can have three different forms: Oxides which naturally gasify and eliminate themselves; oxides which form a solution with bronze resulting in an inclusion without the presence of a reducing agent, or in gases forming blowholes in the presence of a reducing agent, and oxides remaining in the metal as slag inclusions.

Remedies suggested are melting first in a reducing atmosphere, and then changing to an oxidizing atmosphere; in case of finely divided metals cover with borax, fluorspar, etc.; melt as rapidly as possible; purifying by physical or mechanical means such as mechanical agitation, chemical agitation with sodium carbonate to give a boil, and thermic degasifying effected by increasing fluidity of the bath through severe heating followed by slow cooling or by adding a product which lowers melting point or increases fluidity of the metal.

In chemical purifying, oxidizing products will eliminate hydrogen and certain metallic impurities. Oxide of manganese usually is employed; manganese also acting as a desulphurizer. Other oxidizing substances can be used. Metal reducers such as aluminum, silicon and alpax are effective but must be used with care. Zinc is used as are beryllium, lithium and calcium. Metalloids such as charcoal and phosphorus are effective as are ammonium chloride, borax, common salt and calcium carbide. Manganese salts, sodium carbonate and nickel alloys are used as desulphurizers. Only experience can tell the amount of those compounds to be used, and that by making test pieces which are broken and the fractures examined.

Fatigue

The Fatigue of Cast Iron, by J. W. Donaldson, *Foundry Trade Journal*, London, England, July 2, 1936.

In this article the author summarizes and reviews various investigations on fatigue of cast iron, and considers the data available. He concludes that cast iron has a relatively higher endurance limit or fatigue strength in relation to its tensile strength, when compared with other metals and alloys; an endurance ratio of 0.45 to 0.60 being obtained. Fatigue strength is not increased in high-duty irons or by alloy additions, except insofar as the ultimate stress is increased, an equally high endurance ratio being obtained with medium and low grade irons. Brittle cast irons both alloyed and unalloyed, have been found to have endurance ratio above the average values, and in one iron the ratio has approached unity. Ratio of fatigue strength to compressive strength varies between 0.13 and 0.15, and the ratio of fatigue strength to modulus of rupture approximates 0.26.

Effect of surface finish on endurance limit is small, only a slight increase, if any, being found in fatigue strength with ground or polished test bars. Effect of grooving or notching decreases fatigue strength of cast iron very much less than in other materials, and high duty cast irons show the effect to a much greater extent than do medium and low quality irons, due to finer distribution of graphite. Cast iron retains its fatigue strength at elevated temperature better than its ultimate breaking strength, and at temperatures over 600 degrees Cent., the fatigue strength has been found to exceed the static tensile strength. Understressing cast iron for a considerable period increases the endurance limit to a greater extent than in the case of steel.

Methods

Report on Investigations Made with the Object of Comparing the Various Methods of Testing Cast Iron (Communication au sujet de Recherches pour la Comparaison des Methodes d'Essai des Fontes, by Dr. Ing. Gustav Meyersberg. *La Fonderie Belge*, Liege, March-April 1936.

This work was undertaken following a resolution passed at the International Foundry Congress of Liege in 1930. It was decided that a basis of comparison should be from two standpoints: (a) the actual values obtained in different tests for a given property; (b) the dispersion of the results obtained in the various tests; that is, the variations between individual figures in each group of tests, and the mean values.

Nine foundries conducted the tests: Four in Germany, four in Belgium and one in France. The University of Liege, the Central Office of State Railroads in Berlin, and the German National Office for Testing Materials also co-operated.

Tests included in the investigation comprised transverse and tensile strength determination, brinell hardness, shearing and torsion determinations. Specimens used were made under carefully controlled conditions to insure uniformity.

The author gives a full discussion of the results obtained, and summarizes his conclusions as follows:

As regards transverse test, the results on the small Belgian test bars and on the large German test bars were very closely related. As regards tensile tests, dispersion of results depended to a large extent upon the manner in which the tests were conducted.

As regards brinell hardness tests, when these were performed under the best conditions, a dispersion of no more than 2 per cent was noted in the results, for tests made on the same apparatus and under careful control of the operator. In other cases dispersions of 4 and 5 per cent occurred in the results.

As regards shearing and torsion tests, there were notable differences in the dispersion figures relative to the various methods of testing. No simple law was discovered in connection with the torsion test curve, nor as regards tensile strength.

Minnesota Iron Foundrymen Organize

Gray iron foundrymen of southern Minnesota and western Wisconsin met Aug. 15 at Winona, Minn., to consider formation of a chapter of the Gray Iron Founders' society. Following a dinner at the Arlington club, Robert C. Leicht, secretary-treasurer, Winona Machine & Foundry Co., introduced W. W. Rose, executive vice president of the society, who had come from Cleveland to assist in organization plans.

Mr. Rose pointed out ways the national society could improve conditions in the industry and outlined steps that were being taken toward that end. W. E. Robinson, Headford Bros. & Hitchins Foundry Co., Waterloo, Iowa, chairman of the Iowa Chapter, followed this talk with a clear presentation of the changes in conditions the group he represented had brought about through organization, particularly in regard to making its members cost conscious.

Norman Holst, Gillett & Eaton Inc., Lake City, Minn., was elected temporary chairman and Edward Leicht, Winona Machine & Foundry Co., temporary secretary of the newly-formed chapter. Another member will be added to this committee to work out organization details and present them at a later meeting. Representatives were present from Winona, Lake City, Faribault, Albert Lea, Mankato and Austin, Minn., and LaCrosse, Wis.

Book Review

Practical Metallography (Praktische Metallkunde), by George Sachs, 203 pages, 6½ x 9¾ inches, fabrikoid, published by Julius Springer, Berl'n, Germany, and supplied by THE FOUNDRY, Cleveland, and in Europe by the Penton Publishing Co. Ltd., London.

This volume which is printed in German is the third and last of a series devoted to practical metallography. The first two covered melting and pouring, and working and forming of metals while this book discusses heat treatment, which is divided into two classifications. The first is devoted to general laws or rules of changes of state, and that is discussed under four topical headings. The first of those is the importance of the constitutional diagram in heat treatment; the second is on change of state and change of structure; the third on precipitation processes, and the fourth on transformation processes.

The second classification is devoted to heat treatable alloys, and the discussion is divided into six sections covering light alloys and metals, copper alloys, noble or precious metals, nickel and cobalt alloys, iron and steel, and low melting point alloys such as lead, tin and zinc alloys. In addition to heat treatment, the book contains an appendix or supplement of 17 pages on magnetic properties by A. Kussmann.

Plan Foundry Conference at Iowa City

A two-day conference on foundry practice will be held at the University of Iowa, Iowa City, Iowa, Friday, Oct. 30 and 31. The conference is being sponsored by the college of engineering at the university, and the American Foundrymen's association through its Quad-City chapter and the Northern Iowa Foundrymen's association.

The program will consist of sessions on melting practice, sand control and other current foundry problems. The detailed program for the conference, which is similar to the gathering held annually at Michigan State college, East Lansing, Mich., will be announced later.

Show Increase in Public Expenditures

National Industrial Conference board in a report issued Sept. 4 summarizes the board's study of national income and its elements which shows that income derived from government sources that accounted for 8.5 per cent of the total in 1929 has increased to 17.5 per cent 1934. The increase in income derived from government sources between 1929 and 1934 was 37 per cent while the income from private industry and occupations dropped 43 per cent. In the interval studied, 25 per cent of the increase in total national income represented swelling government disbursements. These figures do not include the increased expenditures for relief in 1935 and the payment of the veterans' bonus in 1936, which will be reflected in income estimates for those years.

Consumerr Market Handbook Is Published

Bureau of foreign and domestic commerce, department of commerce, Washington, has prepared the latest of a series of market data handbooks, concerned primarily with the consumer market. This study was designed as a ready reference book presenting the most recent representative and useful statistics pertaining to that market. A significant improvement in this presentation is the analysis of data for cities and other places of 2500 or more inhabitants, rural areas, as well as for states and counties. Copies are available from the bureau for 50 cents.

Ohio Foundrymen Hear Discussion on Sand

At the opening meeting of the fall season held at the Cleveland Club, Cleveland, Sept. 10, members of the Northeastern Ohio Chapter of the American Foundrymen's association heard a description covering the reclamation, conditioning and handling of foundry sand presented by Lester B. Knight, Jr., vice president in charge of sales, National Engineering Co., Chicago. Attention was directed to the importance of a study of sand conditions in the foundry, effect upon the quality of the castings and the opportunity this phase of foundry practice presents for improvement in quality and reduction in cost of operation.

Important variables to be controlled include permeability, bond strength, moisture, and inert fines. The speaker dwelt in considerable detail on the characteristics of each of these variables and the manner in which they are inter-related. Discussing permeability he pointed out that removal of from 2 to 3 per cent of inert fines from a given sand will result in a much larger increase in permeability than the addition of 30 per cent new, coarse silica sand. Comparative cost figures were introduced to show savings effected through the use of modern sand reclamation, reconditioning and control equipment.

In one typical instance, a malleable foundry pouring 100 tons per day, the saving in sand cost paid for the sand preparation unit in 8 months. Additional profits accrued from improvement in quality of castings, reduction in cleaning cost and reduced scrap. Adoption of reclaiming and reconditioning equipment in several steel foundries it is claimed reduced the amount of new sand required per ton of castings from as high as 2500 pounds to between 450 and 800 pounds. The talk was illustrated by a number of slides showing typical installations.

In a coffee talk immediately following the dinner, John J. Joseph, assistant to the vice president, Ohio Bell Telephone Co., Cleveland, described "Some Social and Economic Aspects of the Telephone Industry."

The October meeting of the chapter will include a visit to the plant of the Westinghouse Electric & Mfg. Co., Cleveland.

Elimination of pinholes and improvement of physical properties in aluminum alloys is claimed for a degasifying agent which is based on the effect of certain inert gases which are not soluble in the alloy. The product is added about 5 minutes before pouring and the amount used ranges from ¼ to ½ per cent of the weight of metal.

WHITE ROCK SILICA CO.

2105 TRIBUNE TOWER • CHICAGO, ILLINOIS

Announce that Mr. A. C. Goodnow, formerly president of The Standard Silica Co. has been appointed vice president in charge of production for White Rock.

His many years' experience in the silica sand and flour business is available to our clients. Mr. Goodnow's connection with White Rock is assurance that our products will be of the highest quality. The installation of latest type washing and grading equipment enables us to produce sands of truly uniform quality and grading.

SILICA
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All grades of crude, washed and dried and graded silica guaranteed uniform. We will appreciate your inquiries and specifications for your requirements of these products.

We can supply LABORATORY CONTROLLED, UNIFORM QUALITY, HIGHLY COLLOIDAL WYOMING BENTONITE to your requirements on a competitive price basis for immediate shipment or on contract for future requirements.

SOME EXCLUSIVE TERRITORY OPEN TO DEALERS—WRITE US!

•

PLANT CAPACITY 25 CARS DAILY

A Panoramic View of the White Rock Silica Company of Wisconsin, Browntown, Wisconsin—Deposit and Plant

Operates Shop on Pacific Coast

(*Continued from page 24*)

out any former foundry training.

Somewhat to his surprise and naturally to his gratification, the experiment succeeded to the extent that he installed a small cupola expressly to melt iron for that section of the foundry. Lined to 26 inches the cupola has a melting capacity of 1½ tons per hour and is kept in blast continuously throughout the day. By pouring and shaking out the molds before they have accumulated to any great extent on any given area, a daily production of 10 to 12 tons is secured from a comparatively limited molding floor space. The cupola is bricked about twice a year and between the times is kept in repair by a daily ¾-inch daub of a natural ganister dug out of the adjoining hill.

Isolated by Mountains

Isolated from the industrial middle and eastern states by a vast stretch of sparsely settled territory and great mountain ranges, foundries in the Pacific coast states have been limited to local markets for sales, but on the other hand have had to range far afield for nearly all raw materials. Pig iron at $27.00 per ton is imported from Europe, China, India and Japan. Local gas coke is used for core ovens and other heating purposes, but metallurgical coke is imported from England, Scotland and Germany at an average cost of $14.00 per ton. Some coke is imported from British Columbia.

In recent years the Olympic Foundry Co. has drawn its supply of pig iron from Provo, Utah, where a blast furnace is operated on native ore by the Columbia Steel Corporation. Scrap iron and steel are secured from local sources, with a preference shown for automobile engine scrap. The company maintains its own laboratory and close supervision is kept on the composition of the charges entering the cupolas for the production of various classes of castings. A system of narrow gage industrial track with suitable turntables facilitates transportation of the buggies containing the charges from the various stock piles to the charging doors of the cupolas. Most of the scrap is received in sizes suitable for cupola use, but occasional large pieces are broken under a drop ball manipulated by a winch and boom derrick.

Typical instance of a product developed to meet special conditions is shown in the grate bar Fig. 6. Originally designed for use in lumber mill installations where sawdust and other wood refuse are employed for fuel, that type of fire bar has been adopted extensively not only throughout the Pacific northwest, but elsewhere. It is claimed that the average life of that type grate bar is five times that of others which have been tried under similar operating conditions.

The bar is cast in two pieces, only one of which is shown in the illustration. This is the upper half, the part that comes in contact with the fuel in the firebox. The lower half is made up principally of two longitudinal bars which support a seat for

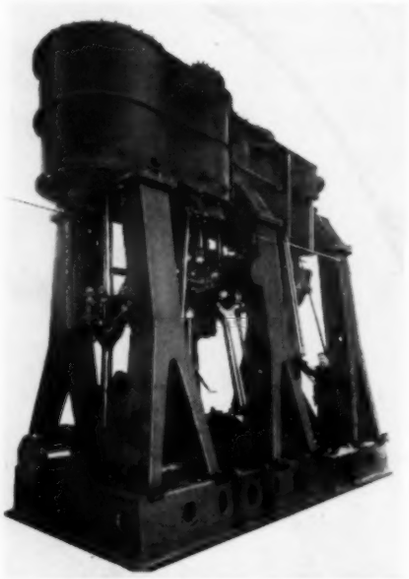


Fig. 8—One of a large number of 3000-horsepower, triple expansion marine engines built by the Olympic Foundry Co.

the pipe coil. This pipe coil is the distinguishing feature of the unit. It is not cast in place. The pattern for the upper part of the casting, and similarly the pattern for the lower half of the unit, leaves a sand replica of the half coil in the bottom of the mold. That feature in the mold for the upper half casting may be noted in the drag of the mold shown in Fig. 6. The casting appears in the immediate foreground with one of the pipe coils between the casting and the drag. After the casting halves have been chipped and cleaned they are assembled in pairs with a pipe coil enclosed between each pair. The half castings are bolted together with the bolt heads resting in the square countersunk holes at each side of the upper face of the casting. In service the required number of grate bars in any given installations are connected to a header which supplies the circulation water.

Grate bar molds are made in comparatively light wood flasks readily handled by two men. The required number of drag molds first is laid out on the floor. Then the copes are made and placed in position. A metal pattern mounted on a thick plank reinforced with battens on the opposite side is employed for molding the drag. The copes are rammed on a plain flat plate. The casting is poured at one end through a single sprue and two branch gates as shown. The bolt holes are formed with dry sand cores. A minor point, but one which indicates the close supervision held over all details may be noted in the absence of a riser of any kind on the mold. Despite the great number of small green sand cores in this mold, the iron lies quietly, a condition partly due to the ramming technique and partly to the use of Belgian sand. This sand carries a high silica content and though apparently close in texture, really is extremely permeable. It is used throughout the shop.

Wide Variety of Castings

Castings for municipal use, lamp standards, waste disposal, street accessories, distribution of water, light and gas are made in wide variety. Typical mold, core flask, corebox and pattern for an 8-inch *T* connection are shown in Figs. 2 and 3. Since the casting is symmetrical a single half pattern suffices for making both cope and drag of the mold. The drag is made first, rolled over and placed on the floor where the core is lowered into position. The cope then is rammed on the same half pattern, lifted off and swung through an arc of 180 degrees horizontally. Then it is placed on the drag. Metal from the sprue enters the flange at one end of the casting through a single gate as shown in the near corner of the drag Fig. 3. A riser on the flange at the opposite end shows when the mold is filled with iron.

The green sand core is rammed by hand in the two-part hinged cast iron corebox shown in Fig. 2. The core is reinforced with a cast iron arbor in two parts locked in the center but which are taken apart for removal from the casting. Semicircular wings near the three ends of the arbor are the full size of the core print. They support the arbor in proper position in the corebox, and later resting on the bottom of the three openings in the ends of the flask, support the core in proper position in the mold. The remaining wings on the arbor, spaced about 5 inches apart provide about ½-inch clearance between the edge of the wing and the face of the core. The arbor occupies space only in one half the core, the part that lies in the drag of the mold.

With the arbor in position in the drag half of the corebox, the two halves are filled with sand, rammed and then struck off flush with the edges. The two halves of the corebox are raised to a vertical position thus

(*Concluded on page 73*)

ADVERTISING PAGES REMOVED

(*Concluded from page 70*)

bringing both halves of the core in contact with each other. The entire assembly is lowered back to a horizontal position with the drag half underneath. The upper part is rolled back as shown in Fig. 2, to expose the complete core which then is lifted out of the box by the extension on the arbor provided for that purpose.

After the core has been placed in the drag and the mold closed a block and wedge are inserted between the arbor extension at each end and the top edge of the opening in the cope. This device anchors the core securely in place. All green sand construction permits a tight fit between core prints on the mold and core and eliminates fins of any kind in that area. After the castings are cleaned they are dipped in an asphaltum bath, a special development of the Olympic Foundry Co., which permits immersion while cold.

This is the first of two articles dealing with interesting features in the plant of the Olympic Foundry Co., Seattle. The second will appear in an early issue.

THE EDITORS.

Eliminate Defects by Avoiding Pitfalls

(*Concluded from page 25*)

face under it as shown at *D* and *I*. Usually in instances of this kind a stud, standard, anchor or chaplet must be placed on top of the print to prevent the core from rising when the mold is filled with metal.

The standard may be incorporated in the cope during the ramming process, or an opening may be formed in the cope above the print. When the completed cope is lowered into place over the core, a brick or other form of standard as shown at *E* is placed on top of the core and the opening carefully is filled with sand. This second method is rather hazardous, especially if the wall of the mold extends upward inside the print. The ramming has to be done very carefully. A chaplet rammed in place on top of the print is the safer method. One of the advantages of the second method, that is where the opening is formed above the print, is that a vent pipe may be inserted and sealed with sand in the vent opening in the core, thus constituting a clear and safe exit for the gas from the core.

Small vertical cores in some castings are held only by a single print in the bottom or drag side of the mold. Pressure of the metal or closing the cope may push them out of position. To prevent this the prints should be of adequate depth and close fitting.

Method of pouring the metal in many instances is an important factor in the production of perfect castings. It is assumed of course that the sprue and gates are correctly sized and placed. The sprue should be kept filled from the moment pouring begins until the mold is filled. Many castings are spoiled by sucking air in with the metal during the pouring period.

For yellow brass castings the sprue should be of adequate size to permit the most rapid pouring. Otherwise smoke spots or zinc spots as they are commonly called, develop and present a pock marked surface.

With aluminum bronze, manganese bronze or even with yellow brass containing aluminum, the metal should be poured in a manner that will permit entrance quietly without turbulence and without any interruption in the stream and without any suction of air. Phosphor bronze should be poured quietly and relatively slowly as compared with the speed of pouring yellow brass. Red brass should be poured a little more rapidly than phosphor bronze, but not with the speed employed in pouring yellow brass.

Builds Plant Extension

Stearns Magnetic Mfg. Co., Milwaukee, formerly the Magnetic Mfg. Co., has started operations on an extension to its plant at 635 South Twenty-eighth street. Additional space provided by the extension will double the capacity of the company.

Directors of the Association of Iron and Steel Electrical Engineers recently changed the name of the organization to the Association of Iron and Steel Engineers.

Book Review

Gmelins Handbook of Inorganic Chemistry (Gmelins Handbuch der anorganische Chemie), edited by the Deutschen Chemischen Gasellschaft, Part A, sections 6 and 7, paper, 254 and 214 pages respectively, 6¾ x 10 inches, published by Verlag Chemie, G.m.b.H., Berlin, Germany, and supplied by THE FOUNDRY, Cleveland, and in Europe by the Penton Publishing Co. Ltd., London.

The two volumes mentioned are a continuation of the series constituting that part of Gmelins Handbook devoted to iron and written in German. Section 6 is concerned with the various iron systems including iron - sulphur, iron - selenium - iron-tellurium, and iron-carbon. The latter part covers such phases as Fe-C diagram, iron carbide, freezing and cooling of carbon steels, crystallization, heat treatment of steel, case hardening, nitriding, and combined carburizing nitriding.

Section 7 is devoted to the magnetic and electrical properties of pure and carbon bearing irons. In the portion on magnetic properties phases covered include magnetic properties of atoms, magnetic properties of materials, susceptibility, permeability, hysteresis, and the various effects such as Barkhausen, Joule, Wiedemann, Thomson, Nernst, etc. On electrical properties the first discussion is that on atoms and is followed by electrical properties of the materials. Phases covered in the latter are resistance, thermoelectric relations in homogeneous materials, dielectric constants, iron in contact with solid and fluid materials, iron in contact with gases and in vacuum, and electrophotophosphorescence.

Exhibit of the Osborn Mfg. Co., Cleveland, located in the Lakeside exhibition hall of the Great Lakes Exposition portrays in a graphic and compact manner, the part the firm's products play in modern industry

Built Early Electric Furnace

(*Concluded from page 26*)

¾-inch diameter, 5 inches high and about 4 inches apart.

The hearth or melting chamber of the furnace 20 inches diameter and 20 inches deep was formed around a wood block. Space between the block and the wall of the furnace was filled with a composition 85 per cent coke breeze and 15 per cent pitch, heated to a temperature of 500 degrees Fahr., thoroughly mixed and rammed in place with an air rammer. A suitable arch and tap hole were formed at one side of the stationary furnace leading to the spout. The roof was silica brick built as a modified arch from the four sides of a steel plate. The plate was square on the outside and was provided with lifting eyes for removal. Suitable openings were provided for charging the furnace and for the single electrode in the center.

So far as operating conditions of the furnace and quality of the metal were concerned the experiment was a success. However, the cost factor was too high and the experiment was discontinued. At that time and in that locality the cost of electric current was 3½ cents per kilowatt hour. Also the power company did not look with favor on the use of a single phase furnace.

Book Review

Proceedings, American Society for Testing Materials, 1935, Parts I and II, published by the association, 260 South Broad street, Philadelphia, and supplied by THE FOUNDRY, Cleveland, for $5.50 each in stiff paper cover, $6 in cloth, and $7 in half leather, plus 15 cents postage, and in Europe by the Penton Publishing Co. Ltd., London.

Reports from 40 standing committees and 136 tentative specifications, either newly published or revised in 1935, are included in Part I. The ferrous metals section contains extensive reports covering standardization and research on steel products, wrought and cast iron, corrosion, magnetic properties, iron-chromium and related alloys, fatigue and effect of temperature. Appended papers discuss fatigue tests on rotating-beam machines and the effect of long-time heating in impact strength of 18:8 steel. Nonferrous metal reports involve copper wire, corrosion, electrical-heating and resistance alloys, cast and wrought copper and alloys, die-cast metals and screen wire cloth. Extensive data are given on the widespread corrosion tests of nonferrous metals and on the extensive exposure tests of die-cast metals. Other detailed reports are given.

In addition to the 37 technical papers presented at the 1935 annual meeting, Part II gives the extensive written and oral discussion, thus providing various viewpoints on the respective subjects. The Marburg lecture, "Aircraft; materials and testing" is included in this part. The symposium on spectrographic analysis comprises six technical papers describing methods in current use as applied to various materials—steel, platinum, magnesium and other nonferrous materials, graphite electrodes, etc.

Table I

Charge Made Entirely of Steel Punchings

No.	Combined Carbon Per Cent	Graphitic Carbon Per Cent	Total Carbon Per Cent	Silicon Per Cent	Sulphur Per Cent	Phosphorus Per Cent	Manganese Per Cent
1	1.11	1.84	2.95	1.87	0.018	0.047	0.58
2	1.14	1.80	2.94	1.87	0.014	0.047	0.62

Table II

Mixture of Punchings and Steel Turnings

No.	Combined Carbon Per Cent	Graphitic Carbon Per Cent	Total Carbon Per Cent	Silicon Per Cent	Sulphur Per Cent	Phosphorus Per Cent	Manganese Per Cent
3	0.90	2.42	3.32	1.84	0.028	0.047	0.57
4	1.02	2.22	3.24	1.76	0.030	0.062	0.55
5	0.92	2.30	3.22	1.83	0.021	0.048	0.59
6	0.86	2.25	3.11	2.17	0.031	0.060	0.53

Table III

Mixed Steel and Iron Turnings and Borings

No.	Combined Carbon Per Cent	Graphitic Carbon Per Cent	Total Carbon Per Cent	Silicon Per Cent	Sulphur Per Cent	Phosphorus Per Cent	Manganese Per Cent
7	0.92	2.15	3.07	1.89	0.021	0.055	0.57
8	0.87	2.12	2.99	2.14	0.030	0.047	0.59
9	0.98	1.70	2.68	2.15	0.030	0.064	0.55
9	1.00	2.20	3.20	2.05	0.019	0.063	0.63

Metal Coatings Measuring Method Given

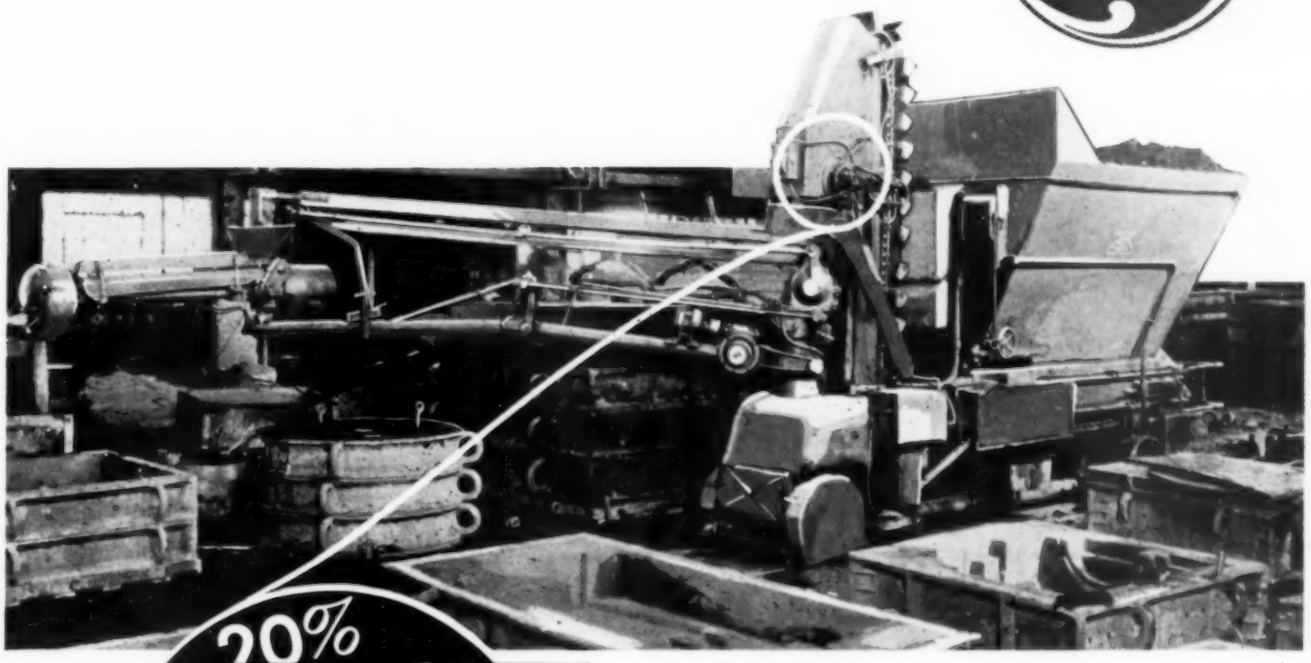
An article on Mesle's chord method for measuring the thickness of metal coatings has been published recently by the United States department of commerce, bureau of standards, Washington. This method depends upon barely cutting through the coating on a plane surface with a grinding wheel of known radius, or on a curved surface with a fine file. Tests on coatings of known thickness showed that the results are accurate within 10 per cent for coatings at least 0.0002 inches thick. Principles and calculations of the method are illustrated with figures and diagrams, methods of application are discussed, and the results obtained on plane and curved surfaces are shown and described. The publication may be obtained from the superintendent of documents, Washington, for 5 cents.

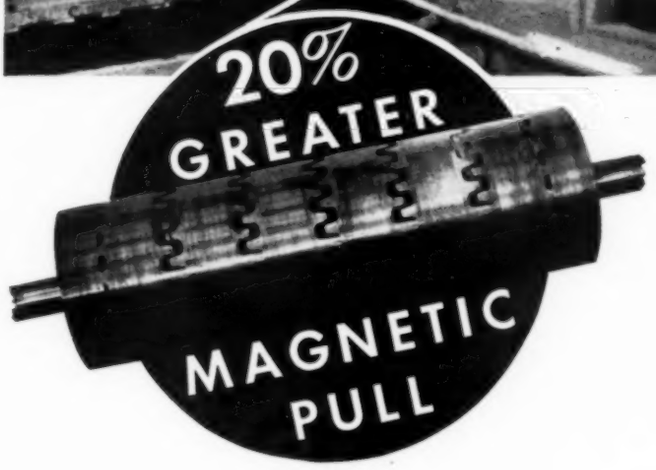
Southern Ohio Gray Iron Founders Meet

Foundrymen representing 36 firms in Southern Ohio met Wednesday, June 10, at Miami Club, Miamiville, O., under auspices of the Cincinnati chapter of the Gray Iron Founders' society. A. C. Pletz, the Blackburn Foundry Co., Cincinnati, presided. Addresses were given by P. E. Rentschler, Hamilton Foundry and Machine Co., Hamilton, president of the society, and W. W. Rose, executive vice president, Cleveland. The social security act with particular reference to old age pension and unemployment insurance was analyzed from its effect on workers and industry alike.

Total production of pig iron in the United States in 1935 was 20,780,760 tons, according to a statistical bulletin from the American Iron and Steel institute, New York. Total ferroalloys production was 591,939 tons. Total half-yearly production of foundry pig iron was 1,645,252 tons on the basis of production in the states of New York, Pennsylvania, Maryland, Virginia, Kentucky, Tennessee, Alabama, Ohio, Illinois, Michigan, Colorado and Utah.

Helping Make *Better* Castings for





HERE is an unbeatable combination for perfect molding—a Dings High Intensity Magnetic Separator and a Beardsley & Piper Sand Slinger helping to give The General Electric Company the high type of castings it requires.

As the sand passes through the Sand Slinger to the charging head, the iron is removed by the Magnetic Separator.

A Dings High Intensity Magnetic Separator in your plant will actually save you money. It will reduce the number of rejected castings and it will make possible the re-use of a higher percentage of your foundry sand.

Even if you are using an old type of separator, you can materially improve the quality of your used sand by taking advantage of new Dings developments which make possible a separator 20% stronger than anything else of its type on the market. Why not ask?

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MAGNETIC CLUTCHES

Dings magnetic clutches solve many a clutch problem. They are simple, operate economically and without attention. Due to their great power and small size, they solve many a clutch problem where reduced space must be considered. They provide smooth engagement, will stop under overload and are particularly adapted to remote control and high speed drives or problems involving accurate synchronization. If you have a clutch problem, let us help you.

Separation Headquarters Since 1899

Cost Rise Outstrips Prices

(*Concluded from page 27*)

flects another story. There with the 1933 average price per ton as a basis, 1934 showed only 105.33 and 1935, 107.99 per cent.

The price average per foundry follows:

Average Price per Pound	1933	1934	1935
2.50 to 2.99	12	2	8
3.00 to 3.49	17	15	11
3.50 to 3.99	20	24	21
4.00 to 4.49	32	26	26
4.50 to 4.99	23	24	30
5.00 to 5.49	37	33	21
5.50 to 5.99	22	25	25
6.00 to 6.49	9	22	27
6.50 to 6.99	9	8	10
7.00 to 7.49	6	7	10
7.50 to 7.99	7	8	4
8.00 to 8.49	2	3	6
8.50 and up	4	3	1
	200	200	200

Examining the migration between classes, we found that in 1934 ninety-five foundries increased their prices, sixty-eight remained the same and thirty-seven decreased theirs.

Tracing the ninety-five who increased their prices in 1934 over 1933 into the year 1935, we found 22 increased prices, 36 showed no change and 37 decreased.

In 1935, 59 increased prices, 80 showed no change and 61 decreased.

This migration does not necessarily indicate anything since the character of jobs obtained or quality required may have justified the price trend. It is interesting to note, however, that during the study an effort was made to plot the movement from class to class, year by year, but the graph became a hopeless cat's cradle and was abandoned.

The accompanying table shows the percentage change in actual prices paid in supplies in the different foundry areas in 1933 and 1935.

The overall percentage advance in each area is as follows:

	Percentage Advance
Seattle	7.82
Oakland	8.73
Chicago	14.69
Milwaukee	17.05
Cincinnati	13.51
Cleveland	10.17
Buffalo	12.84
Philadelphia	8.29
Connecticut	12.36
Massachusetts	15.74
St. Louis	19.19

Is it not significant of something that the percentage of increase in average casting price, as noted with 1933 as a base, increased only 5.33 per cent in 1934 and 7.99 per cent in 1935? In other words, the maximum increased percentage return to foundrymen was less than 8 per cent, while the prices of commodities purchased by foundries and entering into castings costs ranged from 7.82 to 19.19 per cent higher in 1935 than in 1933.

Unfortunately no reliable labor statistics appear to be available. However, the labor trend has been generally upward so, if we are to draw any conclusions, it would seem that there has either been a wonderful advance in the efficiency of management throughout the industry or else the gray iron foundryman should look into his cost accounting.

Green Sand Core For Making Iron Pipe

(*Continued from page 31*)

After the core is made it is lifted out of the drag and placed temporarily on any suitable supports, or into a mold, if one is ready. Procedure at this stage is optional. Under certain conditions the pipe making crew may be worked to better advantage by setting up a pair of supports near the molding floor and having one part of the crew making cores while the remaining members make the molds either by hand or on a jolt machine or sandslinger. This feature depends on the number of castings required per day to complete any given order.

Size, shape and number of vent holes in the barrel depend to some extent on the permeability of the sand and the thickness of the casting. The tapered vent holes in the core barrel are made by placing small tapered, or pyramid cores on the main core. They are held in place either with a small nail or a dab of paste. On a heavy pipe the danger of the metal breaking through the vent holes is greater than on a light pipe where the metal solidifies more rapidly. For this reason many foundrymen favor a narrow rectangular vent opening, rather than a circular opening of the same area. For a heavy pipe the tapered rectangular vent holes might be $\frac{1}{4}$ x 1-inch on the outside of the barrel and $\frac{1}{2}$ x $1\frac{1}{4}$-inch on the inside. However, in the present instance with a pipe only $\frac{1}{4}$-inch thick, the tapered circular vent holes may be $\frac{3}{8}$ or $\frac{1}{2}$-inch on the outside and $\frac{3}{4}$-inch diameter on the inside. Straight, drilled holes are not as satisfactory as tapered vent holes. They become plugged with sand and claywash which bakes into a hard mass and thus prevent gas and steam from passing through readily. Vent holes are spaced approximately 4 inches apart all over the barrel. With extremely permeable sand a smaller number of vent holes is sufficient, but on a new job it is better to err on the safe side. Tapered dabbers or small circular or rectangular knobs $\frac{3}{4}$-inch high spaced about the same distance apart on the outside of the barrel will hold the sand. These features are shown in Fig. 1. Before the barrel is set up on the stands it is coated with thin paste or claywash. With a heavily bonded sand the barrel may be dampened merely with clear water. The barrel shown in Fig. 1 is 7 inches inside diameter, 9 inches outside diameter, thus allowing for a 1-inch thickness of sand.

In making the barrel casting care should be taken to chaplet the core firmly in the center. If the core springs, the barrel casting will warp, either during the original cooling, or, in service later and create a lot of trouble, both in sweeping the green sand cores and in removing the barrel from the pipe casting. Great care also is required in sweeping the green sand core to eliminate soft areas. The metal will swell in any areas of this kind and interfere with removal of the barrel from the pipe casting.

Light Gas in Barrel

Attention also is directed to the fact that with this type of core, the escaping gas if allowed to accumulate in the hollow barrel, forms an explosive mixture, which if lighted too late may wreck the core and casting. A bunch of oily waste or a handful of shavings is placed in each end of the barrel and lighted before any metal is poured into the mold. This will ignite the gas in the early stages, prevent accumulation and mixture with air and consequent explosion. The mold is poured through long horizontal runners and a number of flat, thin gates formed in the joint on both sides of the mold.

In an alternative method the green sand core may be made in a half corebox as shown in the accompanying freehand sketch, Fig. 2. The core is reinforced with a substantial cast iron arbor with the circular end plates wedged in place. The backbone 3 x 7 inches extends $3\frac{1}{2}$ inches above the wings to insure rigidity. The wings are spaced about 6 inches apart and extend to within $\frac{3}{8}$-inch of the corebox on the bottom and $\frac{3}{4}$-inch at the sides. A piece of 2-inch pipe extends through each of the openings in the end plates. After the core is finished these pieces of pipe are pulled out to provide vent openings through the core. The upper part of the core is formed with a curved strike or strickle. The end plates rest in the openings in the ends of the corebox and thus support the arbor in proper position in the corebox. Later the end plates rest in similar openings in the ends of the drag and support the core in proper position in the mold.

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Founding Pressure Castings

(*Concluded from page* 30)

iron. The analysis which has been followed for years is as follows: 2.30 to 2.50 per cent silicon; 0.09 to 0.11 percent sulphur; 0.50 to 0.60 per cent manganese; 0.25 to 0.45 per cent phosphorus, and 3.30 to 3.50 per cent total carbon.

This analysis is a common one for the general run of small and medium castings. Reference already has been made to the decrease in the total carbon of that particular mixture during the past 2 or 3 years.

One thought that stands out above all others in connection with this mixture when used on pressure work is it gives the best results when it is melted hot and poured hot. Every attempt to economize on coke, both as to quality and quantity used has resulted in low spout temperatures, more shrinks and draws in the castings and more leakers in the test floors in the machine shops. Invariably, a heat, in which there has been a dull period, is followed by an increase in defectives due to draws or shrinks, at points which are prone to shrink.

Internal defects and shrinkage may be the biggest sources of trouble in a foundry, called upon to cast pressure work. There are six basic ideas followed in our shop to combat shrinks, draws and internal sponginess in the castings, which are poured from this soft iron mix. The ideas and the order in which we use them follow:

List Brass Ideas

1. The internal defect commonly called shrinkage, may be caused by gas from the mold or core. Whenever shrinkage is mentioned we think of two things: (a) Permeability of the molding and core sands, and (b) Venting of the molds and cores.

Innumerable shrinkage troubles have been eliminated through the use of additional vents in the molds and cores. One rather simple job returned 25 per cent loss in leakers. Regardless of the gating practice, the iron mixtures used, etc., the leakers continued. The venting of 3 small pockets in the cores eliminated the trouble and the loss dropped below 1 per cent. Impellers for centrifugal pumps developed shrinks and spongy spots on the hubs and wearing rings. A very fine sand was used in the core to insure smooth water ways, for high efficiency. Change to a very coarse open sand and a special core oil which enabled us to use an oil-sand ratio of 1 to 80, provided a free venting core which removed the shrinks. The smooth surface in the rough core was obtained by a high grade plumbago wash. So we look to the venting of the molds and cores first whenever shrinkage shows up in a run of castings.

2. If venting does not cure the trouble we experiment with the gates. We place the ingate so that the point at which the shrinkage takes place will get comparatively dull metal, that is gate as far from the seat of shrink trouble as possible. Usually the ingate is made as small as will run the casting. Thus feeding is going on while the casting is being run. Part of the runner which connects the down sprue with the ingate always is placed in the cope, to provide a means of ridding the iron of any slag or loose sand.

Change Style of Gate

3. If that gating fails then the ingates may be placed near the chunky part that shrinks and increased in size. Possibly the runner is increased as well as the down sprue. A strainer core then is placed in the pouring basin at the top of the cope to serve both as a choke for slow pouring and to keep the basin full to prevent slag and dirt from being carried into the mold. As soon as the mold is full the sprue now acts as a feeding head. If the strainer core is set in the joint of the mold, the sprue shuts off quickly so does not serve as a feeder. The runner and ingate may be enlarged as stated, to further the feeding effect of the sprue.

4. If these methods fail, a riser is used. The riser and the opening from it to the casting are made as large as the casting will permit so that feeding takes place until the casting is set. Quite often the use of a riser with this soft grade of iron makes for a coarse open grained structure where the riser attaches.

5. If that is so then chills are used, but no risers. The use of chills or denseners is never a complete cure, but considerable relief may be had from their use.

6. If all of the previously described measures fail on any one job, we discontinue casting them in soft iron and use a high test iron analyzing from 1.80 to 2.00 per cent silicon and 3.00 to 3.20 per cent total carbon, adding 1 per cent nickel, in the ladle, for machinability. Usually we can dispense with risers and use common gating practice.

It is our belief, in connection with this soft iron mixture, that the condition of the carbon in the charge affects the condition of the carbon in the finished casting. That is, a finely divided graphite in the pig iron and the scrap used makes for a finely divided graphitic carbon in the casting, provided the cupola is operated so as to bring the charges down hot and fast. The new style pig now being cast, which weighs only 40 pounds, shows a much finer grain structure, and a slightly higher combined carbon than the old pig of twice the size, because the small pigs cool much more rapidly. The use of some outside scrap, of such a size and wall section that the graphitic carbon will be finally divided and in not too high an amount, is good practice.

In conclusion, it is our thought that for castings to withstand internal pressures, the most important element in cast iron is carbon. Our practice indicates that decreasing the total carbon content below the percentages usually encountered in high test irons, the means by which we decrease it, and the hot-pouring of these lower carbon irons make for a finer grained structure. This refining of the grain size provides both pressure-tightness and increased strength.

An attempt was made to ascertain the manner in which the iron mixtures mentioned in this article, freeze. Data were taken from the works of Hanson, Honda, Murakami, Conterman, Kriz and Poboril in connection with the liquidus surface of the iron-silicon-carbon system. The accompanying table gives these data. The answer to the question of why a casting weighing 2000 pounds, consisting of sections varying from 11/16 to 2½ inches in thickness and cast with no feeding heads does not show any signs of internal defects is not apparent to the author of the table. It does show why low carbon irons trap gases given off by the mold and core.

The author takes this opportunity to express his thanks to Professor G. B. Upton, Cornell university, Ithaca, N. Y., for his aid.

Data on Liquidus Surface of Fe-Si-C System

Silicon Per Cent	Total Carbon Per Cent	Temperature at Which Freezing Starts, Degrees Fahr.	Temperature at End of Freezing, Degrees Fahr.	Per Cent Solid Metal When Eutectic Temperature Is Reached	Per Cent of Liquid Eutectic
1.50	2.50	2400	2060	60	40
1.80	3.00	2280	2060	35	65
2.50	3.25	2195	2060	15	85
2.50	3.50	2125	2060	....	100

Gray Cast Iron

(*Concluded from page* 33)

In general, the solid contraction of gray iron depends largely on the percentage of graphite — the greater the graphite content the less the contraction. Thus with high carbon content accompanied by high silicon or other graphitizing elements there exists a tendency toward lower solid contraction. For similar reasons the solid contraction of heavy section usually would be expected to be normally less than that of light sections, in a given iron.

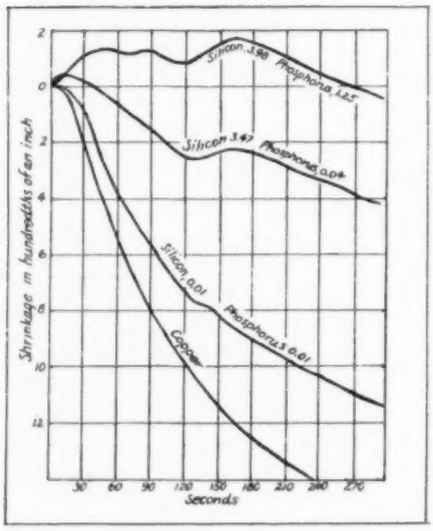


Fig. 126—Curves showing the contraction and expansion of some pig irons and copper according to Turner

Table XXI

Effect of Carbon Increase on Expansion

Analysis			Mean Coefficient of Expansion × 10^{-6} (20-t) Degrees Cent.					
Carbon Per Cent	Manganese Per Cent	Silicon Per Cent	100	200	300	400	500	600
0.06	0.08	tr.	11.7	12.3	13.0	13.6	14.2	14.6
0.81	0.10	0.06	11.0	11.6	12.4	13.2	13.8	14.2
1.67	0.17	0.11	10.4	10.3	11.4	12.3	13.1	13.7
1.97	0.15	0.08	9.9	10.0	11.1	12.2	13.1	.....
2.24	0.15	0.08	9.6	9.6	11.0	12.1	13.2	.....
3.66	0.14	0.09	8.6	8.8	9.9	11.3	12.5	13.2
3.80	0.16	0.05	8.7	8.5	10.1	11.5	12.6	.....

Phosphorus and sulphur were low in all cases. The samples were tested in an annealed condition after a heat treatment of 30 minutes at 1000 degrees Cent.

Engineering Fields Discussed In Booklet

Rensselaer Polytechnic Institute, Troy, N. Y., presents an interesting analysis of the three growing engineering fields, metallurgical, aeronautical and chemical, in a booklet written primarily for students who are contemplating entering these fields. Promising opportunities not only for material success but also for interesting and adventuresome service are set forth in an understandable and instructive manner. Facilities for teaching these types of work in the Rensselaer Polytechnic Institute are pointed out and described as being of particular value to the student desiring the necessary groundwork for such careers.

Book Review

Foundry Work, by R. E. Wendt, head instructor in foundry practice, Purdue university, cloth, 240 pages, published by the McGraw-Hill Book Co., New York, and supplied by THE FOUNDRY, Cleveland, for $2.00 and in Europe by the Penton Publishing Co. Ltd., London.

This is the third edition of a well-prepared work written to provide a suitable text for schools and colleges and for use by apprentices in commercial shops. Numerous developments in castings manufacture, such as mass production, alloy gray irons and alloy steel castings, standard pattern colors, design of castings, etc. are discussed in this third edition.

The author has divided this work into four major parts, the first dealing with different groups of casting metals and the fundamental principles of dry sand core making and molding. Problems of melting are presented in the second section including the melting of iron in the cupola, pig iron, coke and fluxes, making of mixtures and testing of gray iron.

Different exercises in bench and floor molding, dry sand core making, provide manual instruction in the third section. That part also deals with problems encountered by managers of foundries, engineers and metallurgists. The fourth section features nonferrous metals including melting, mixtures, etc. A glossary of foundry terms and useful tables also are included.

The work is well illustrated with reproductions of photographs and drawings.

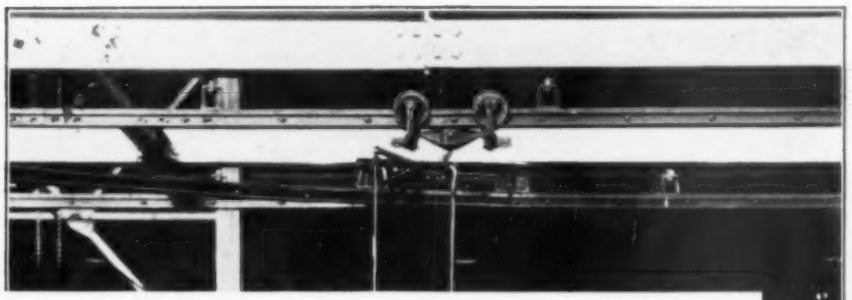
United States department of the interior, bureau of mines, has presented detailed statistics concerning coal, in an appendix to the minerals year book, 1935, written by W. H. Young, L. Mann, H. L. Bennit and F. G. Tryon. The booklet may be obtained through the superintendent of documents, Washington, for 5 cents.

Table XX

Volume Change of Various Cast Irons

	No. VIII		No. VII		No. I		No. IV		No. IX		No. XIII		No. II		No. III		No. XIV		No. VI	
	1½ inch Bar	¾ inch Bar	1½ inch Bar	¾ inch Bar	1½ inch Bar	¾ inch Bar	1½ inch Bar	¾ inch Bar	1½ inch Bar	¾ inch Bar	1½ inch Bar	¾ inch Bar	1½ inch Bar	¾ inch Bar	1½ inch Bar	¾ inch Bar	1½ inch Bar	¾ inch Bar	1½ inch Bar	¾ inch Bar
Linear contraction from 2102 F. (1150 C.), per cent	0.67	1.08	0.83	1.08	0.93	1.13	0.95	1.11	0.97	1.08	0.98	1.09	1.06	1.11	1.08	1.12	1.12	1.17	1.31	1.77
Linear contraction from 1958 F. (1070 C.), per cent	0.90	1.17	1.04	1.14	1.13	n.d.	n.d.	1.22	1.12	1.19	1.03	1.13	1.24	1.25	1.19	n.d.	1.17	1.21	n.d.	n.d.
Shrinkage during solidification, per cent	0.07	1.65	0.62	1.11	n.d.	n.d.	1.94	1.73	0.82	1.10	0.07	1.31	n.d.	n.d.	1.59	1.94	0.00	0.07	5.82	4.85
Liquid contraction per 100 C. (212 F.), per cent	1.1		1.1		n.d.		1.1		1.1		1.1		n.d.		1.1		1.1		1.1	
Density at room temperature, g. per cu. cm.	7.02	7.01	7.09	7.10	7.10	7.13	7.26	7.29	7.03	7.04	7.08	7.08	7.12	7.12	7.27	7.31	7.14	7.15	7.66	7.70
Density at 2102 F. (1150 C.), g. per cu. cm.	6.89	6.80	6.90	6.85	6.90	6.89	7.04	7.04	6.85	6.80	6.89	6.80	6.90	6.89	7.04	7.04	6.90	6.90	7.35	7.30
Density at liquidus, g. per cu. cm.	6.90		6.94		n.d.		6.92		6.89		6.89		n.d.		6.92		6.89		6.95	
Liquidus temperature:																				
deg. Fahr.	2102		2102				2282		2102		2111				2282		2183		2462	
deg. Cent.	1150		1150		n.d.		1250		1150		1155		n.d.		1250		1195		1350	
Total carbon, per cent	3.69	3.63	3.67	3.76	3.63	3.63	3.10	3.10	3.39	3.60	3.27	3.27	3.71	3.71	3.08	3.08	2.90	2.89	2.18	2.29
Graphitic carbon, per cent	3.53	3.42	3.26	3.35	2.97	2.99	2.31	2.27	3.20	3.40	2.88	2.90	2.99	2.96	2.18	2.23	2.68	2.65	0.56	0.42
Silicon, per cent	2.87		2.10		2.08		1.69		2.86		2.87		2.11		1.68		2.88		1.24	
Phosphorus, per cent	0.68		0.46		0.44		0.35		0.67		0.59		0.46		0.35		0.66		0.27	
Manganese, per cent	0.59		0.54		0.50		0.48		0.58		0.52		0.50		0.44		0.44		0.35	
Sulfur, per cent	0.03		0.05		0.05		0.04		0.03		0.03		0.05		0.04		0.03		0.04	

Note—"n.d." denotes "no determination."



Remove labor from handling

Get better castings, greater production, lower costs—when handling is made easy on American MonoRail.

Send for this book

Used as a standard reference in many technical libraries.

Foundry labor is hard even under the best conditions and the greatest part is handling — lifting and carrying sand, core boxes, flasks, molten metal, castings. ● ● ● When this work is made easy, on a single track loop or a crane that covers the entire floor area, or a continuous pouring system, your founders are not so quickly fatigued. As a result they produce better work at a faster pace and a lower cost. ● ● ● American MonoRail equipment is designed primarily for easy operation. Trolleys equipped with precision bearings roll smoothly on runways made continuous by over-lapping sections. Improvements in switches and cranes insure safety and free action ● ● ● Whether your production demands manual or electric operation, let our engineers make recommendations that will help take the labor out of your handling process.

THE AMERICAN MONORAIL CO

13104 Athens Ave., Cleveland, O.

Obituary

JOHN C. HASWELL, long an active and outstanding figure in the foundry industry, died at his home in Dayton, Aug. 27, following a brief illness. Mr. Haswell was born in Galveston, Texas, in 1861. His first employment was with Walter A. Wood Co., Hoosick Falls, N. Y. In 1897 he was made general manager of the Marion Malleable Iron Co., and in 1915 he became president and general manager of the Dayton Malleable Iron Co. Recently he became chairman

John C. Haswell

of the board of the organization. In addition to the Dayton Malleable Iron Co., which operates plants in Ironton and Canton, O., as well as Dayton, he was identified with Pratt & Letchworth Co., Buffalo, and the Gartland, Haswell, Rentschler interests with its various plants. He was active in the Malleable Iron Research institute and later with the Malleable Foundries society, the code organization of the malleable industry. He was a director of the Malleable Founders society and the Ohio Manufacturers association. Funeral services were conducted at the Baptist Church in Dayton, Aug. 31.

♦ ♦ ♦

John Campbell, 63, founder and president of the Campbell Foundry Co., Harrison, N. J., died Aug. 10 at his home in South Orange, N. J.

♦ ♦ ♦

Irwin W. Cooley, 62, for 23 years a foreman at the Commonwealth Division of the General Steel Castings Corp., Granite City, Ill., died at his home after a long illness.

♦ ♦ ♦

Frank J. Eppele, 72, for many years president of the Trenton Malleable Iron Co., Trenton, N. J., died Aug. 10 at Sergeantsville, N. J. He was born in Schenectady, N. Y., and in 1888 was graduated from Rensselaer Polytechnic institute, Troy, N. Y. In 1925, Mr. Eppele served as president of the National Association of Malleable Iron Manufacturers. He was active in Trenton banking circles, and headed the Capitol Building & Loan association and the Wilbur Trust Co. Also he has served as president of the Trenton chamber of commerce.

♦ ♦ ♦

William P. Westenberg, 67, formerly secretary and treasurer, Wisconsin Malleable Iron Co., Milwaukee, died recently at his home. Mr. Westenberg left the firm when the plant was destroyed by fire in 1930.

♦ ♦ ♦

Sir Marmaduke Winter, 80, president of the Standard Mfg. Co. and the United Nail & Foundry Co. Ltd., Newfoundland companies, died Aug. 12 in St. Johns, Newfoundland. He was active in several lines of business enterprise, was appointed to the Newfoundland legislative council in 1910 and knighted in 1923.

♦ ♦ ♦

S. J. Gardner, president, S. J. Gardner Foundry & Machine Co. Inc., New Albany, Ind., died Aug. 11 at New Albany. Mr. Gardner was 73 years of age and had been the head of the business since its inception in 1897. The company will continue under the direction of E. Merwin Gardner, a son.

♦ ♦ ♦

Gideon C. Batten, for 27 years superintendent of the iron foundry, Lunkenheimer Co., Cincinnati, O., died recently at Oscoda, Mich., after an illness of several weeks. He was an expert metallurgist and chemist and held patents on a number of foundry operations.

♦ ♦ ♦

Irvin F. Lehman, 65, president and one of the founders of Blaw-Knox Co., Blaw Knox, Pa., died Aug. 5 at Lake Amston, Conn. Mr. Lehman was well known in the industrial and civic life of Pittsburgh and had taken a leading part in several charitable drives. Mr. Lehman succeeded to the presidency of the company a year ago upon the death of his brother, A. C. Lehman, co-founder of the company.

Besides the presidency of the Blaw-Knox Co., Mr. Lehman was vice president of various company subsidiaries, including National Alloy Steel Co., Lewis Foundry & Machine Co., Pittsburgh Rolls Corp., Union Steel Castings Co. and Blaw-Knox International Corp. He was also a director of the Keystone National bank, Pittsburgh.

♦ ♦ ♦

William H. Nicholls, 57, president of the William H. Nicholls Co., Inc., New York, died Aug. 12 in Glen Cove, Long Island, New York. He had served the foundry industry for over forty years, devoting the greater part of this time to cost and production problems. He was founder of the company bearing his name and an inventor of numerous machines. Born and educated in New York, at the age of 16 Mr. Nicholls entered the foundry industry as an apprentice molder. He studied engineering at the Pratt institute, Brooklyn, N. Y. In the early days of his career he served as molder

William H. Nicholls

in various foundries in the United States and started in business for himself in 1910. He had made successful recommendations on production problems to many foundries in the United States, Canada and Europe.

Book Review

Bibliography of Non-metallic Inclusions in Iron and Steel, by Lois F. McCombs and Morris Schrero, fabrikoid, 6 x 9 inches, 308 pages, published by Carnegie Institute of Technology, and Mining and Metallurgical Advisory Boards, Pittsburgh, and supplied by THE FOUNDRY, Cleveland, for $4 plus 15 cents postage, and in Europe by Penton Publishing Co. Ltd., London.

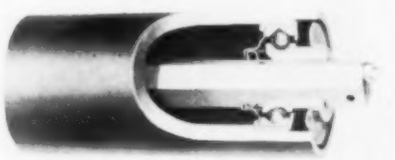
Those interested in nonmetallic inclusions in iron and steel have in this volume a bibliography of literature in which every item has been examined to insure that it is definitely related to the subject. The book contains 2136 items which are listed alphabetically by authors with many other additional references to reprints, translations and abstracts. Each item contains a brief annotation which does not attempt to perform the function of an abstract.

ADVERTISING PAGES REMOVED

NEW EQUIPMENT . . . . *for foundries*

Foundry Bearing Has Outer Steel Shield

Standard Conveyor Co., North St. Paul, Minn., has developed four new types of protected bearings, each designed for a particular operating condition in gravity conveyors. The



A collar of grease is left between the outer shield and the bearing when flushing

bearings fall into two general classifications: for foundry use and for steel mill use. The former type is shown in the accompanying illustration.

A stationary outer steel shield protects the bearings from molten metal which would otherwise lock the roller and cause vibration of the molds or commodities. Flared shape of the shield throws foreign matter away from the bearing. A collar of grease is left between the outer shield and the bearing when flushing. Inner shield holds the grease so that flushing is said to be necessary only once every 12 to 18 months, depending on conditions.

Self-Closing Fire Door Lifts Vertically

Cornell Iron Works Inc., Long Island City, N. Y., has developed a self-closing vertical lift fire door. Door section may be of tin-clad wood, structural steel covered with asbestos or any standard fireproof construction.

In operation, the door, partially balanced by a counter-weight, slides vertically between guides so designed that no amount of expansion due to heat can cause sticking. Operating mechanism consists of one or more oil cylinders with piston rods connected to the door or counterweight and supplied with oil by a motor driven pump. The system is closed and under pressure so that the door cannot close until valves are operated properly. For emergency closing, the melting of a fusible link opens a release valve permitting the door to close but holding its closing speed to any desired rate.

Mercury Lamp Has Peanut-Size Bulb

Westinghouse Lamp Co., Bloomfield, N. J., has developed a new 85-watt mercury vapor lamp, a miniature model of the 400 and 250-watt lamps produced by the company for use in illuminating factory interiors.

The light-giving element of this lamp consists of a peanut-size bulb of fused quartz, approximately 1½ inches long and ⅜-inch in diameter, in which the mercury vapor forms an arc when subjected to an electrical discharge. Light center length is 3 inches, overall length, 5⅝ inches and the base is medium screw.

Air Hose Is of Combination Construction

B. F. Goodrich Co., Akron, O., has placed a new air hose on the market said to be designed for all types of air tool applications. It is a combination construction made in long lengths, the inner carcass consisting of four plies of specially woven duck. The outer carcass is a tight braid of high tensile cords which are applied with a high tension.

Between the inner and outer carcass is a substantial insulation which serves as a secondary tube to seal off penetration of air through the walls of the hose and cushion blows from the outside. Due to the bias design of the wrapped fabric, any air or fluid which reaches it travels only a short distance before reaching the terminal point of the yarn. The unit is furnished in three sizes, ½-inch, ¾-inch and 1-inch, and will be made in 500-foot lengths.

Abrasive Mask Has Latex-Covered Silk Hood

Mine Safety Appliances Co., Pittsburgh, has introduced a new abrasive mask. Illustrated herewith, the complete unit consists of hood, facepiece, connecting tube, flow control valve with bump proof adjustment, quick release connection, optional air filter

Abrasive Mask Has Latex-Covered Silk Hood

and a web belt to support the valve and filter. The all-rubber face piece has a wide vision rectangular glass lens. Incoming air enters the lower part of the face piece and passes out through double exhalation valves. The latex-covered silk hood fits over head and shoulders of operator and fastens at the waist.

The setting of the flow control valve cannot be changed accidentally since the handle is held in a released position by a spring and must be pushed into an engaged position and then turned to change the flow of air. Should the air supply fail, a quick release enables operator to break his connection, breathe through the charcoal cartridge filter on the free end of the corrugated tube and leave the confined space.

Stoker links made from an alloy cast iron containing 15 per cent chromium have excellent resistance to heat and corrosion. Such links after two years in service show little difference in appearance from that evident in the original cast state.

Electric Hoist Used for Spot Handling

Harnischfeger Corp., Milwaukee, is marketing a new line of electric hoists with capacity ratings from 250 to 500 pounds. The unit is shown in the accompanying illustration. The hoists are designed primarily for spot handling work in machine shops, storage booths, foundries, etc. Light in weight and embodying all-welded

The hoists have lifting speeds up to 32 feet per minute

construction, the hoists have lifting speeds up to 32 feet per minute.

Push button or pendant control is furnished. To simplify installation, all complicated wiring has been eliminated. Positive safety is said to be assured by a limit switch, solenoid dry disk motor brake and ratchet and roller type mechanical brake. Standard units are furnished with or without trolley.

Starting Motors

Westinghouse Electric & Mfg Co., East Pittsburgh, Pa., has developed a unit for across-the-line starting of single phase and polyphase induction motors and as primary switches for wound rotor induction motors. Employing the principle of arc interruption, the motor has a thermostat disk overload relay for protection purposes. An inverse time characteristic prevents shut downs due to overloads. It is claimed that an arc quencher confines, divides and extinguishes the arc almost instantaneously without the flash and attendant scattering of flame.

Recording Pyrometer

Leeds & Northrup Co., Philadelphia, has designed a new recording potentiometer pyrometer, providing in the one instrument all combinations of indicating, recording, signalling and controlling. Control and signal contacts are said to operate undisturbed by air currents when the door is opened. The pen holds a seven-week ink supply. A bold scale and pointer shows the condition at the moment, and a clear record on ten visible inches of strip-chart shows it for the past several hours.

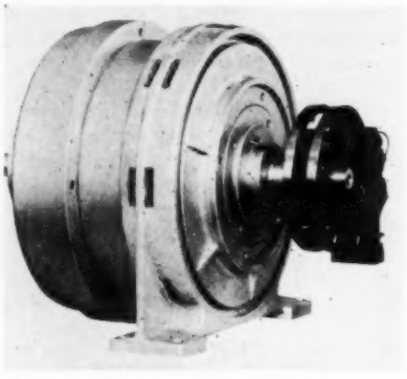
Cleaning Materials Applied Under Pressure

A heavy-duty industrial cleaning unit has been placed on the market by Homestead Valve Mfg. Co., Coraopolis, Pa. The cleaner utilizes a mixture of vapor, hot water, soap or a selected chemical, and pressure, carrying its own fuel tank, water and solution tanks, oil burner and vapor generator. Water and solution are pumped from their respective tanks and automatically mixed to a predetermined proportion on the way to the coils where the solution is heated.

By turning a valve on the cleaning gun, a vapor spray emerges from its nozzle, combining its velocity with the reaction of the heated cleaning solution and breaking up the accumulation of dirt. Two operators may work simultaneously from one machine by the addition of a second cleaning gun connection and by increasing the unit's pressure and general capacity to meet the extra load.

Clutch Brake Is Actuated Mechanically

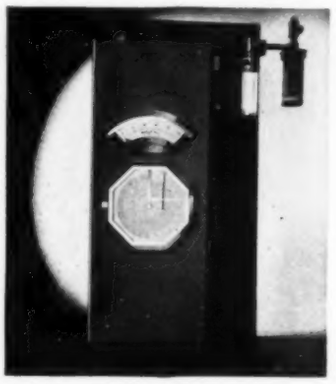
Magnetic Mfg. Co., Milwaukee, has developed a clutch-brake, shown in the accompanying illustration. Approximately 24 inches in diameter, the unit has a clutch torque of 4500 pounds feet and a brake torque of 1500 pounds feet. The brake is actuated mechanically through springs and is claimed to stop the drive whenever the electric circuit is opened. The unit has virtually no moving or wearing parts with exception of the friction linings.



The unit has a clutch torque of 4500 pounds feet

Meter Measures Carbon Dioxide Content

Latest developments in the measurement of CO_2 are said to have been incorporated in the newly-designed meter recently placed on the market by the Republic Flow Meters Co., Chicago. Shown in the accompanying illustration, the meter is driven by a fractional horsepower electric motor and requires no water for its operation. Stoppage in the gas line is elim-



No water is required for operating the meter

inated by a suction capable of drawing 14 inches of mercury.

The per cent CO_2 is measured by the Orsat method, and the meter is built to duplicate mechanically this chemical analysis. A large caustic tank holds enough potash to last from four to six months and temperature variations are said to have no effect on meter readings. A filter in the gas line removes all SO_2 from the flue gas before it reaches the analyzer and a permanent, continuous, pen line record is inscribed which may be read directly. Related factors may be combined in one circular chart.

Small Electric Switch

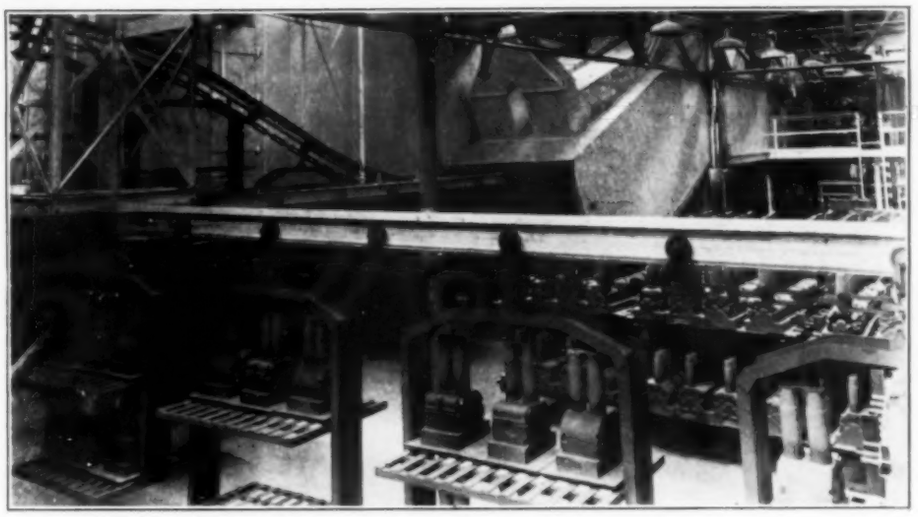
General Electric Co., Schenectady, N. Y., has developed an electric switch which is silent in operation and has no moving parts. The switch is the size of a marble and utilizes the mercury-break principle in construction.

The switch consists of two hollow chrome-nickel cups, sealed with a strip of lead glass to form a hollow compartment. The cups are separated by a disk of ceramic material having a small hole near its edge. When rotated 20 degrees the switch assumes a position where the mercury can flow through the hole, establishing contact between the two cups and closing the circuit.

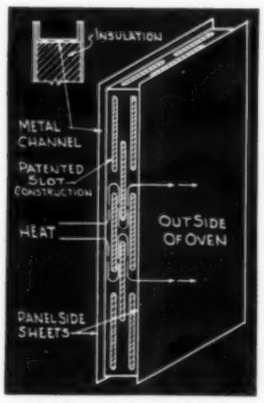
FURTHER ACHIEVEMENTS

(The Carl-Mayer Way)

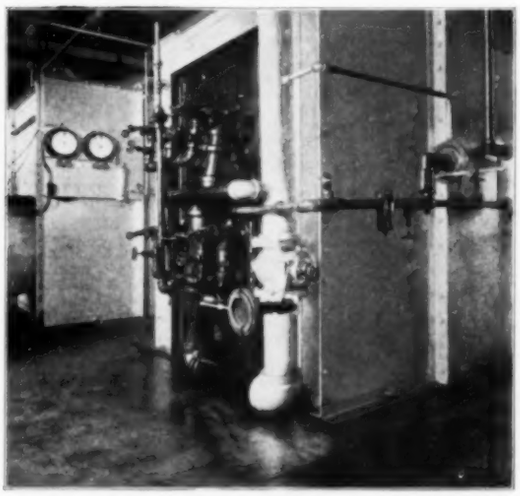
IN CORE AND MOLD OVEN INSTALLATION



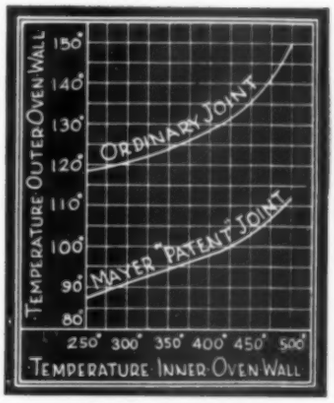
New Continuous Monorail Barrel and Crankcase Core Oven At The Packard Motor Car Company
(One of Seven New Units by Carl-Mayer)



Mayer Oven Wall Construction.
Patent No. 1843430



(Gas) Mayer Air Heater. (Oil)
At Packard and American Radiator Co.



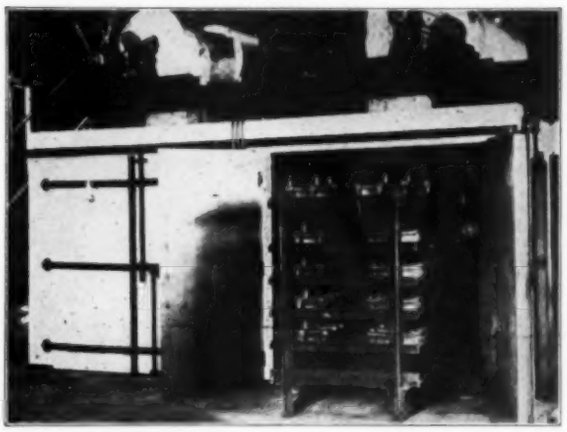
Mayer Oven Wall Efficiency
30% Greater

INTERESTING FACTS

About The Packard Installation:

1. **Efficiency 30% greater than desired guarantee.**
2. **Core baking time reduced proportionately.**

These results attributed to "Mayer" patented Oven Wall and Air Heater design.



Rack Type Gas Fired, Air Heater, Core Ovens at Electric Autolite Co.

COMPARATIVE DATA:

Referring to The Electric Autolite installation:

1. **Former baking time in brick core ovens 4½ hours. Baking time in Carl-Mayer ovens 2½ hours for largest cores and 1½ hours for smaller cores.**
2. **Savings per day for each battery of two ovens $21.00.**

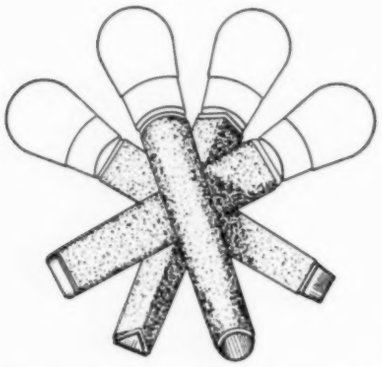
Result! *Three* repeat orders this year.

Write for New Literature to

301 Euclid Ave. THE CARL-MAYER CORP. Cleveland, O.

Holds Abrasives for Variety of Operations

Keeler Mfg. Co., 2410-12 South Keeler avenue, Chicago, has introduced a new abrasive holder. The working part or body of the tool is 9¼ inches long and is fitted with a 3¾-inch wood handle mounted in a substantial ferrule. Round, square, triangular and flat shapes are provided.



The holder may be used with cloth or paper abrasives

The tools, shown in the accompanying illustration, can be used on any operation where abrasive cloth or paper is used by hand. Both cloth and paper backings are supplied by the company in garnet or flint, alumina oxide, emery or crocus. The abrasive as supplied by the makers is creased on the inside. The end to be inserted in the holder first is plainly marked. The taper on the holder stretches the abrasive so that it lays in position under enough pressure to hold it.

Handles Power Control

Link-Belt Co., Chicago, has developed a new power control for use on cranes and shovels, featuring short easily-thrown levers. The unit is said to have no wearing parts between the clutches or brakes. The operator is seated behind the conveniently located control stand. A large truck type seat is adjustable both as to height and proximity to control stand.

Solvent Cleaner

A. F. Curran Co., Malden, Mass., has developed a self emulsifying solvent cleaner for automobiles, motors, trucks and airplanes. To remove oil and grease the surface is treated with a solution of that fluid dissolved in kerosene or other low cost solvent. After penetration the treated oils and greases may be removed easily by hosing with cold water. It is said to have the property of causing oil and water to mix perfectly.

Unit Cooler Turns in Any Direction

A new cold water type unit cooler has been developed by the Modine Mfg. Co., Racine, Wis., employing the method of cooling by circulation of cold water. Suspended in the room, it is equipped with a motor and fan which draws the room air through the unit, absorbing heat and moisture and returning cooled air into the room.

The cooler can be turned in any direction without changing existing piping connections by loosening a lock nut and two unions. Vertical fins and a specially insulated drain tank make it unnecessary to use a moisture eliminator. No mechanical change is necessary to convert the unit for heating operations.

Welding Torch Features Light Weight

Modern Engineering Co., St. Louis, has produced a new light weight welding torch, shown in the accompanying illustration. This torch with a standard tip weighs 17½ ounces.

A new method of boring passages to rifle smoothness has been developed in this unit. Ideal flame characteristics are claimed under any operating circumstances in the full range of welding practice. Other features of this torch include spring-tension equipped wheel handles which are said to assure permanent adjustments even with rough handling and bumping. Wheel handles are of fluted design and the grip is thin with a wide fluting.

Spring tension equipped wheel handles are employed on the torch

Small Electric Tool Marks on Any Material

Ideal Commutator Dresser Co., Sycamore, Ill., has developed a portable electric tool for marking on practically any material. In addition to metals, it is claimed that this marker will write on glass, pottery, rubber, bakelite, fiber and similar materials.

The unit may be plugged into any 110-volt, 60-cycle alternating current circuit. It is said that the point does not stick into the metal in marking. Standard equipment includes a six-foot extension cord, plug and on and off switch.

Marker writes on metals, glass, rubber, bakelite and other materials

Unit Controls Diaphram Valve Operation

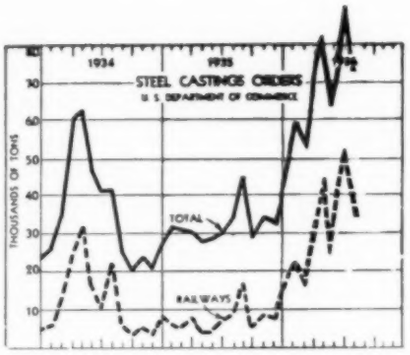
Taylor Instrument Companies, Rochester, N. Y., has introduced a precision valve action unit for applications where load changes are not a problem but valve-stem friction and diaphragm-motor hysteresis must be overcome to obtain precision control. The device is designed for process which have time lags or heat capacities demanding a low or medium controller sensitivity, provided the load changes are negligible or infrequent.

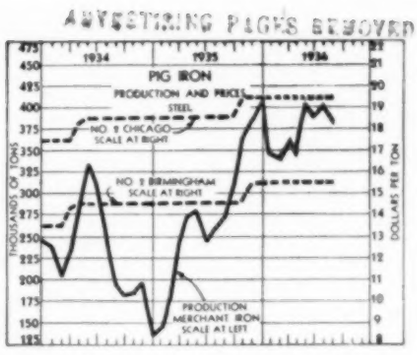
A noncorrosive case and cover protect the mechanism. The only necessary adjustment is to adopt the mechanism to the full travel of the valve stem. An indicator which shows the actual percentage of valve opening is visible through a small glass window.

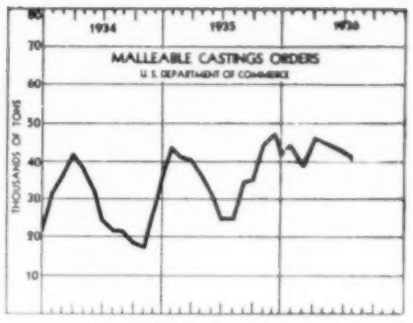
Vacuum Blower Is One-Piece Assembly

Steel City Electric Co., Pittsburgh, has introduced a combined motor and pump unit for moderate pressure or vacuum pumps. Designed as a one-piece assembly unit, it is fan-cooled, and has no belt, chains, shafts, drives or gears. It is manufactured in a large range of capacities in both single and double type.

The blower is said to clean and free pattern shop woodworking machines from wood cuttings and shavings in a short time. It may be moved from one machine to another or act as permanent equipment. The unit may be used also as a blower for any type of small furnace.







Foundry Activities

Reflect Industrial Trends

WILSON FOUNDRY & MACHINE CO., Pontiac, Mich., is to be reorganized as an independent corporation according to D. R. Wilson, president. Money for recapitalization of the firm is being subscribed now. Under the former arrangement, the foundry was a subsidiary of the Willys-Overland Co. although the foundry did not go into receivership as did the parent company..

* * *

Meeker Foundry Co., Newark, N. J., was damaged by fire recently.

* * *

Pacific Car & Foundry Co., Renton, Wash., suffered damage to its plant recently.

* * *

Forest City Foundries Co., Cleveland, has been granted a permit to construct a $2500 addition.

* * *

Ace Foundry Co., Chicago, has moved to a new location in the building at 1712-44 North Kostner avenue, Chicago.

* * *

Kinney Bronze Tablet Co., Bellaire, O., has been organized to manufacture bronze tablets. Robert Kinney is president.

* * *

Mueller Brass Co., 1925 Lapeer avenue, Port Huron, Mich., is contemplating a $31,000 addition to its brass shop.

* * *

Schultz Die Casting Co., Wallaceburg, Ont., proposes to construct a new $50,000 factory. A. St. Clair Gordon is manager.

* * *

Superior Tractor Co., Stockton, Calif., has been organized to conduct a tool making and foundry business. J. M. Kroyer, G. M. Kroyer, D. A. McAllister, R. B. Webster, and G. M. Giocovini, all of Stockton, are incorporators of the concern which is capitalized at $750,000.

* * *

El Dorado Foundry, Machine & Supply Co. Inc., El Dorado, Ark., has been granted a charter to enter the manufacturing field in Texas. D. L. Butler, Rodessa, La., is Texas agent.

* * *

Kerskamp Bros., 737 Buffalo street, Sheboygan Falls, Wis., will be remodeled by its successor, Kerskamp & Potts Foundry Co. Edward Kerskamp is president, Francis Potts, vice president and L. J. Steinle, secretary-treasurer.

* * *

Contract has been awarded for the remodeling of the foundry building of the Winona Machine & Foundry Co., Winona, Minn. Edward Leicht is sales manager of the company.

* * *

Reed Foundry & Machine Co., Kalamazoo, Mich., has been incorporated with a capital of $50,000. Ralph M. Fisher, 2700 Fulford street, Kalamazoo, is one of the incorporators.

* * *

Duriron Co., Dayton, O., proposes to construct a 50 x 80-foot, 1-story addition to its foundry building. Geyer & Neuffer, Ludlow Arcade building, Dayton, is the architect.

* * *

Simmons Bros., 5 Court square, Long Island City, New York, maker of a photograph enlarger constructed principally from steel drill rods and aluminum castings, plans to move into larger quarters soon.

* * *

Western Foundry Co., East Armstrong street, Morris, Ill., has taken over the property of the Illinois Foundry & Specialty Co. and will operate it after an idleness of 10 years.

* * *

Sheffield Bronze Powder & Stencil Co., Sheffield, O., plans to move its plant from Cleveland to Bedford, O., if local capital assists. The company would move into the former Best Foundry Co. plant on Forbes road.

* * *

Reliance Bronze & Steel Co. Inc., 65-105 Dobbin street, Brooklyn, N. Y., has been formed to acquire the

RAW MATERIAL PRICES
Sept. 9, 1936

Iron	
No. 2 foundry, Valley	$19.50
No. 2 Southern, Birmingham	15.50
No. 2 foundry, Chicago	19.50
No. 2 foundry, Buffalo	19.50
Basic, Buffalo	18.50
Basic, Valley	19.00
Malleable, Chicago	19.50
Malleable, Buffalo	20.00
Charcoal iron, furnace	22.00
Coke	
Connellsville beehive premium	$5.50
Wise county beehive coke	$ 4.30 to 5.00
Detroit by-product coke	9.00
Scrap	
Heavy melting steel, Valley	$17.25 to $17.75
Heavy melting steel, Pitts.(dlv.)	17.00 to 17.50
Heavy melting steel, Chicago	16.00 to 16.25
Stove plate, Buffalo	10.00 to 10.25
Stove plate, Chicago	9.00 to 9.50
No. 1 cast, New York	12.00 to 12.25
No. 1 cast, mchy., Chicago	13.50 to 14.00
No. 1 cast, Pittsburgh	15.50 to 16.00
No. 1 cast, Philadelphia	16.00 to 16.50
No. 1 cast, Birmingham	11.50 to 12.00
Car wheels, iron, Pittsburgh	17.00 to 17.50
Car wheels, iron, Chicago	16.00 to 16.50
Railro. d malleable, Chicago	17.50 to 18.00
Malleable, Buffalo	15.50 to 16.00
Nonferrous Metals	**Cents per pound**
Castings copper, refinery	9.47
Straits tin	45.10
Aluminum, 99 per cent	19.00 to 21.00
Aluminum, No. 12 (Secondary, standard)	16.75 to 17.25
Lead, New York	4.60
Antimony, New York	12.50
Nickel, electro	35.00
Zinc, East St. Louis, Ill.	4.85

assets of Reliance Bronze & Steel Corp. E. F. Gillespie is president of the new concern and Charles A. Andres, vice president and general manager.

* * *

Production of steel castings increased during July, according to reports received from the Industrial Research department of the University of Pennsylvania on foundries operating in the Philadelphia Federal Reserve district. Gray iron foundry production, however, suffered a 10 per cent decrease from the June production figures. Even with that drop, production was 32.4 per cent above that of a year ago and higher than any other month after October, 1930.

* * *

Cupal Casting Co., Martins Ferry, O., has been organized and will manufacture bronze castings and other items in the former Rail and River power house on South Belmont street. Joseph S. Anderson is prominent in the firm.

NEW Trade Publications

WIRE ROPE — Williamsport Wire Rope Co., Williamsport, Pa., has issued a revised edition of its pocket catalog No. 34 on wire rope for all purposes. Specifications and descriptions of the various kinds of wire rope and cables are included in this catalog, together with their many uses and advantages. The booklet includes information on wire rope for material handling, fitting and slings, flexible hoisting rope, cables and general information for wire rope users.

TRUCKS—Lewis-Shepard Co., Watertown, Mass., has issued a folder giving brief literature and construction elements pertinent to its line of floor trucks and industrial wagon trucks, including a few type photographs.

HANDLING EQUIPMENT—Barrett-Cravens Co., Chicago, has released a folder on its line of lift trucks and elevators, emphasizing application, operation and construction details.

FANS—Propellair Inc., Springfield, O., gives information on its line of circulating fans in a recent folder. A checklist of major features includes photographs of various installations.

AIR CONDITIONING — Ingersoll-Rand Co., Phillipsburg, N. J., has issued a 6-page bulletin describing its motor pump for use in air conditioning. Pumps for air conditioning service and systems are offered in several types.

CONTROLLERS—Bristol Co., Bristol, Conn., has prepared a bulletin discussing its line of free-vane controllers for time-temperature, flow, liquid level, pressure, time-pressure and humidity.

REFINING EQUIPMENT — Mathieson Alkali Works Inc., New York, gives information on the use of purite in the covered insulated ladles for the reduction of temperature loss in refining metal for light castings, in its latest bulletin.

FURNACES — Philadelphia Drying Machinery Co., 3351 Stokley street, Philadelphia, has published two bulletins describing high speed hardening furnaces. One bulletin is devoted to oil fired furnaces and the other to gas fired furnaces,both of which are made in single and twin chamber models. Details of construction, features of design, and tables of sizes and capacities are included.

OPTICAL INSTRUMENTS—Bausch & Lomb Optical Co., Rochester, N. Y., has published a catalog on special optical parts, lenses, prisms, mirrors, quartz in the manufacture of optical parts, miscellaneous optical parts and optical sets.

CONVEYORS—Eastern Corp., New York, has prepared in a recent publication an engineering data sheet entitled "How to Select Your Roller Conveyor." Announcement of its new conveyor with tubular axle and locking pins is included.

MATERIAL HANDLING—All Steel Welded Truck Corp., Rockford, Ill., discusses its lifting units, jacks and trucking devices in a publication. Platforms for many requirements, with specifications, also are described.

ROLLING GRILLES—Cornell Iron Works Inc., Long Island City, N. Y., has published a bulletin concerning its rolling grilles for all types of buildings. Description, advantages and typical installations are a part of the bulletin.

TRANSMISSION APPLIANCES—T. B. Wood Sons Co., Chambersburg, Pa., has prepared a condensed catalog on its line of power transmission appliances. Pillow blocks, rigid bearings, couplings, friction clutches and V-belt drives are features of the literature.

WELDING—Linde Air Products Co., New York, has presented a well-illustrated booklet on oxy-acetylene welding of brass and bronze, divided into two sections. The first deals with the technique of fusion welding brass and bronze, and the second pertains to the welding of commercial yellow brass pipe.

COMBUSTION — Hauck Mfg. Co., Brooklyn, N. Y., has prepared a booklet covering industrial combustion data in full detail. It attempts to answer many of the questions which present themselves to heating and combustion engineers and to assist those concerned with the operation of furnaces, ovens and other heat processing equipment in solving problems and methods of effective heating economy and improved operation.

NICKEL ALLOY STEELS—International Nickel Co. Inc., New York, has assembled in one folder selected items and data on low temperature properties of nickel alloy steels, covering both the results of research and of service in practical applications.

COMPRESSORS AND PUMPS—Ingersoll-Rand Co., 11 Broadway, New York, has cataloged its line of industrial compressors and vacuum pumps in a recent bulletin. Units mounted on horizontal and vertical tanks mounted on carriages and certain specifications are added.

MELTING COST—Campbell-Hausfield Co., Harrison, O., makes a comparison of melting costs in a recent publication. Considerations governing selection of melting equipment, design and operation of types and advantages and disadvantages of the various types of furnaces are given consideration.

BRASS FLUX—Cleveland Flux Co., Cleveland, lists the advantages derived from use of its brass flux in the manufacture of valves, plumbing supplies and castings required to stand a pressure test, in a recent booklet. Other fluxes produced by the company are treated briefly.

VIBRATING SCREENS—Link-Belt Co., Chicago, has published information concerning its two types of vibrating screens, the unbalanced pulley type and the heavy-duty positive drive type, in an attractive booklet. Illustrations, dimension sheets, capacities and operating photographs are included.

REFRACTORIES — Standard Fuel Engineering Co., Detroit, has published its standard handbook on refractories, a 48-page manual of information for engineers, plant superintendents and others interested in the control of heat. Various methods of applying high temperature cements are shown, including tables of weights and measures of the types of fire brick used in industry.

REFRACTORIES — Mullite Refractories Co., Shelton, Conn., in a bulletin entitled "Shamva Mullite," gives description and characteristics of properties, strength and uses of this 3300 degree super-refractory. Applications include forging furnaces, crucible furnaces, electric and open-hearth furnaces, enameling and annealing furnaces, ceramic kilns and locomotive fire boxes.

ELECTRIC WELDING—Air Reduction Sales Co., New York, has issued a booklet on electric welding products—electrodes, arc welding machines and miscellaneous apparatus—with description and illustration of physical properties, welding procedure, flowing qualities, penetration, etc. The last section consists of a group of tables especially useful to the welder, and an excellent summary of the causes of bad welds.

INSULATING MATERIALS—Johns-Manville Corp., New York, has released a new 60-page book containing a wealth of information and recommendations on high and low temperature insulations for every industrial need. Among new products described in detail are a thin-walled

(*Concluded on page* 94)

On Guard
to insure your casting success

Back of the sand used daily in progressive American foundries is an interesting story. It starts in the early days of the foundry industry when "catch-as-catch-can" methods prevailed—and it hasn't reached its final chapter yet. It is a story of scientific research, of patient checking and rechecking, of testing and retesting, year after year, with only one goal in view. That goal has been, and is, the success of foundrymen, and the increased efficiency of American foundry methods.

◆ ◆ ◆

Today, modern scientifically blended and graded molding sand is the foundry's greatest guarantee of safety and operating economy. As knowledge in sands advanced, foundry costs and casting losses dropped. Good molding sand, the one item for which there is no substitute, has always been the cheapest—and today—is the most important factor in safeguarding profits.

◆ ◆ ◆

The name AYERS stands out among the leaders of those who have written the brilliant story of present day molding sand. AYERS CERTIFIED SANDS, offered in more than thirty grades, insures maximum safety and economy in every known casting operation.

◆ ◆ ◆

FIFTY-THIRD YEAR

The Ayers Mineral Company
Zanesville • • Ohio

AYERS
Certified Sands:

SMOOTH-ON No.4
in new and greatly
IMPROVED COMPOSITIONS

Smooth-On No. 4AA. For light gray castings and machined surfaces. Has high metallic lustre and takes a fine machine finish.

Smooth-On No. 4A. For medium gray castings. A fine-grained cement that has a good metallic lustre.

Smooth-On No. 4B. For dark gray castings. A cement of coarser grain and darker shade.

GET the free samples. Hold the *hardened* ones on the card aside of your own product and you will see that the *wider color and lustre range* offers desirable selection for any casting. If your filled surfaces must be machined note the fine finish on the milled portion of the No. 4AA sample.

Then try the *working* samples, and note the big improvement over the results you have been getting. The standard shades may be modified in the application.

Do yourself and us the justice of making a critical test and you will find your filling problems *well solved.*

Mail the coupon for samples and prices. Smooth-On Nos. 4AA, 4A and 4B are packed in 1-lb. and 5-lb. cans, 25-lb. pails and 100-lb. kegs.

Smooth-On Mfg. Co., Dept. 17,
570 Communipaw Ave., Jersey City, N. J.

Please send working samples of
☐ Smooth-On No. 4AA ☐ Smooth-On No. 4A ☐ Smooth-On No. 4B
☐ Hardened samples of all three

Name.....

Address.....

.....

9-36

SMOOTH-ON

(*Concluded from page* 90)

form of asbestos-cement electrical conduit, a mineral insulation for low temperature piping and a non-impregnated asbestos-cement sheet for switchboard panels.

MOLDED SHAPES—Norton Co., Worcester, Mass., has prepared its standard and special price list concerning its line of abrasives and molded shapes, rectangular units, hollow and solid cylinders.

TESTING MACHINES—Steel City Testing Laboratory, Detroit, features its hydraulic testing machine made in capacities from 500 pounds to 100,000 pounds for either hand or power operation, in a recent bulletin.

VIBRATION ELIMINATION—Korfund Co., Long Island City, N. Y., has prepared a new bulletin treating the subject of machinery isolation by steel springs. Erection, adjustment, construction, specifications and typical installations are included.

SPROCKET WHEELS—Link-Belt Co., Chicago, has completed a 24-page book tabulating the cut-tooth sprocket wheels with finished-steel roller chains available in the company's plants and warehouses and distributors.

MECHANICAL LIFTERS—Lewis-Shepard Co., Watertown, Mass., describes its line of mechanical lifters for product manufacturing and handling, specially hard-to-handle products, etc., where conditions of space and size make handling difficult, in an attractive circular.

MOLYBDENUM — Climax Molybdenum Co., New York, has published information on various tests made to illustrate the effects of molybdenum on the different properties of base analysis cast irons. Analysis, physical properties and series, with a final conclusion on the tests, are given.

CUPOLA CONTROL SYSTEMS—Edwin S. Carman Inc., Cleveland, has prepared a small booklet containing information on its system of cupola control, giving results and listing services rendered by the company in regard to the various activities of the foundry industry.

VACUUM CLEANING — Spencer Turbine Co., Hartford, Conn., in an interesting bulletin, describes what is claimed to be more than a quarter of a century of experience in the application of vacuum cleaning to industrial work. Data on its line of various-sized cleaners of different horsepower are given including dimensions and capacities.

BAKELITE—Bakelite Corp., New York, gives the composition of phenolic resinoid as an introduction to its latest booklet on this subject. Molding materials, cellulose-filled materials, properties, process of molding, machining, preforming, standard tests and special materials of bakelite are further subjects discussed and illustrated in this new publication.

TRACTOR - TRAILER UNITS — Fruehauf Trailer Co., Detroit, has issued an interesting booklet entitled "Executive Thinking" which analyzes the cost of operating truck unit in comparison with operation of one of the company's tractor-trailer units.

TRAVELING CRANES — Whiting Corp., Harvey, Ill., has published a booklet on its newly designed overhead electric traveling crane. Herring-

Faked Foundry Facts

Clay Wash

bone gears together with roller bearings, oil-bath lubrication, welded steel trolley frames, etc., are a few of the features described in the publication which also gives numerous illustrations for use of the unit.

OVERHEAD SYSTEMS—Richards-Wilcox Mfg. Co., Aurora, Ill., has published a booklet containing 32 pages of valuable description, designs and illustrations of the company's switches, overhead tracks, clamps, brackets, safety baffles, swingout devices, cranes, trolleys, etc.

MALLEABLE CASTINGS — Lake City Malleable Co., Cleveland, has presented an interesting folder on malleable castings. Using but a few of the company's products in illustration, the folder concentrates on drawing an analogy between the words of Daniel Webster to the Senate in 1833 and the castings produced by the company. Also, a letter is reproduced emphasizing a saving effected by use of patterns made by the Lake City company.

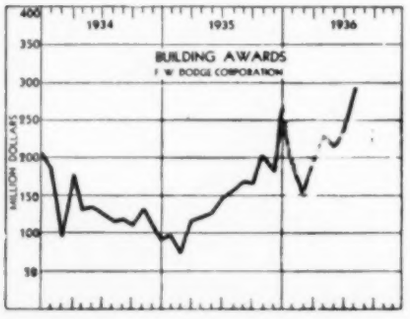
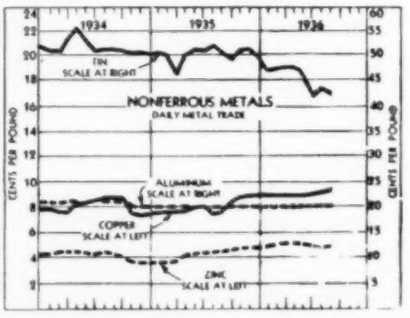
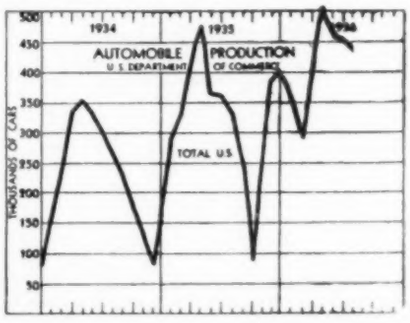
METERS—Republic Flow Meters Co., Chicago, has presented a data book on its line of CO_2 meters, containing complete specifications covering their construction, operation and application. Interesting statements on perfect combustion, chemical analysis, dimensions, etc., are included, amply illustrated by photographs.

COMBUSTION CONTROL — A 32-page bulletin, "Air-Operated Combustion Control," distributed by the Bailey Meter Co., Cleveland, explains the automatic readjustment of the fuel-air ratio to reduce furnace maintenance and effect combustion economy. Diagrams and photographs illustrate the application of the system to boilers ranging in size from 200 horsepower up, fired either with fuels in suspension or with stokers.

NICKEL CAST IRON—International Nickel Co. Inc., 67 Wall street, New York, has investigated the thermal expansion characteristics of some nickel cast irons, with particular attention devoted to those compositions which possess generally useful engineering properties. Results are published in a recent data sheet section. Literature, apparatus, test specimens, results, and blueprints are included.

SPEED REDUCERS—Falk Corp., Milwaukee, has issued two bulletins describing the company's standard parallel shaft and right angle speed types speed reducers and giving standard ratios and capacities for general industrial applications.

MICROSCOPES—Bausch & Lomb Optical Co., Rochester, N. Y., presents data, illustration and specifications on its new improved wide field binocular microscope, in a recent publication.

PYROMETERS—Leeds & Northrup Co., Philadelphia, in a late catalog, relates information on its thermocouple pyrometer line, including indicators, recorders, controllers and accessories. General and specific information is given.

HOISTING EQUIPMENT—Yale & Towne Mfg. Co., Philadelphia, has issued a booklet as a guide to the selection of the correct company hoisting and conveying equipment. The ten major features of the design of this equipment are given in graphic form and a listing of the various products of the company is included.